# Audubon

SUMMER 2025

**PLUS**

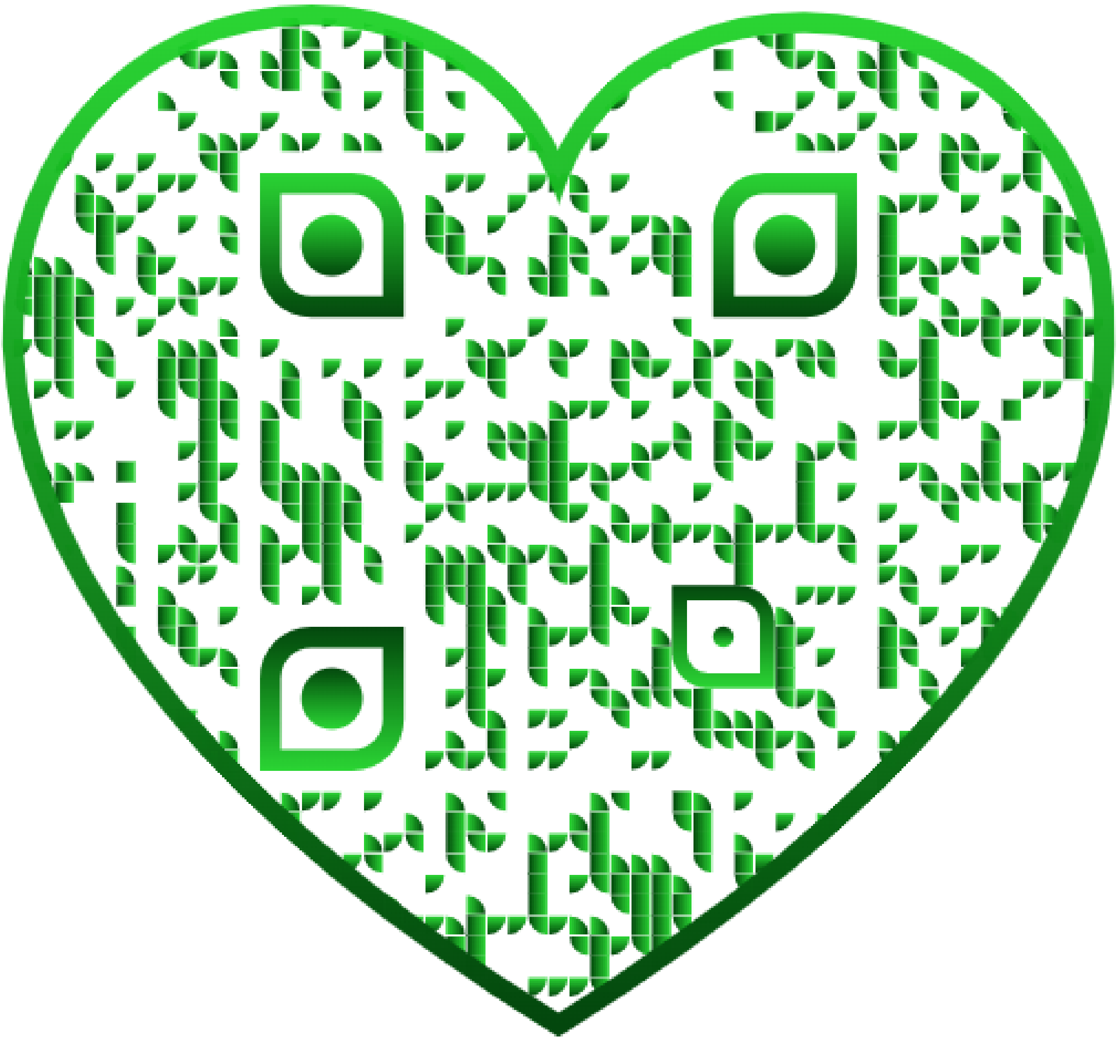
Inside the feeder cam craze

Alaska's vital ecosystems and wildlife at risk

On the move with Mallards

## No Small Feat

Piping Plovers are staging a big comeback on the Great Lakes, showing resilience in the face of predators, lengthy migrations, and rising waters.



# Pacific Paradise

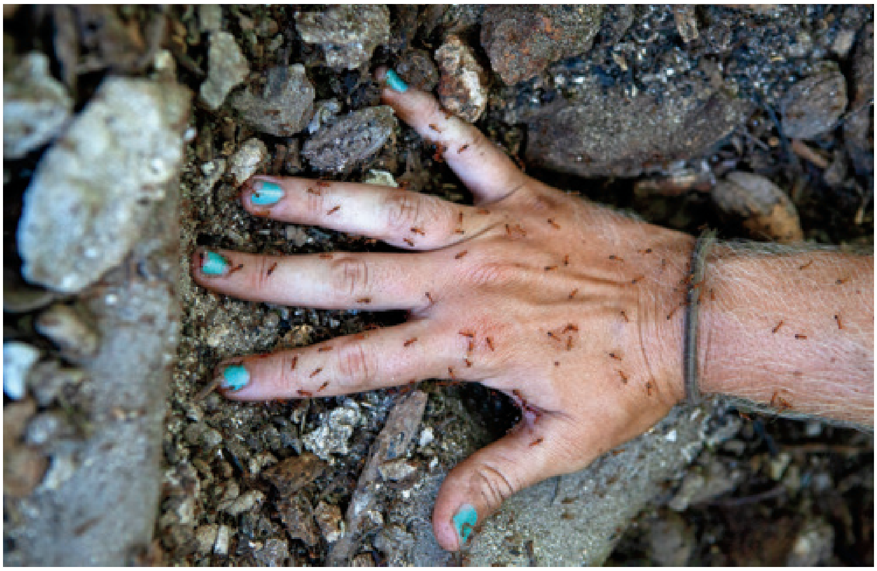
Of the nearly 600 national wildlife refuges in the United States, Johnston Atoll is arguably the one visitors are least likely to set foot on—unless they're seabirds. A former military base located some 700 miles southwest of Hawai'i, today Johnston and the atoll's three other tiny islands are a haven for 1.5 million seabirds from 15 species. That transformation was no easy task, and this flourishing refuge with a complicated history may soon face new challenges.

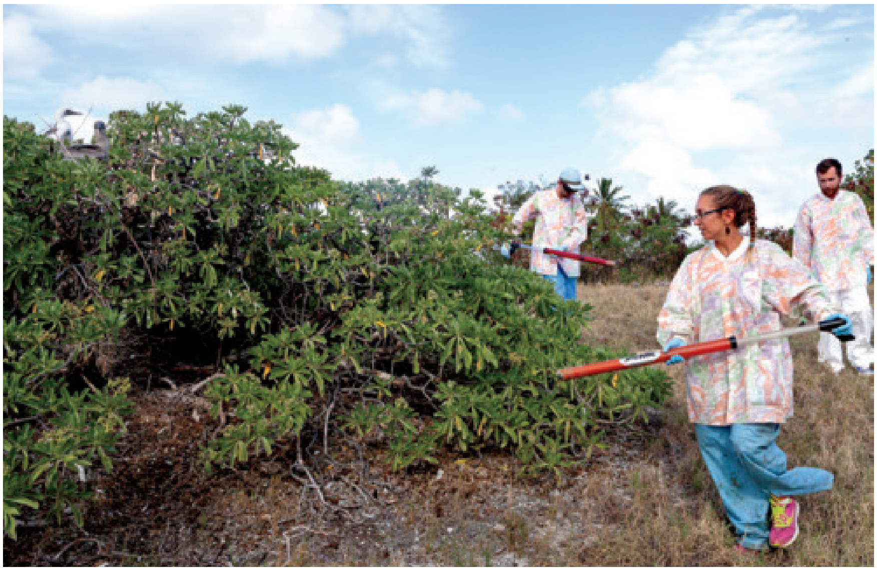
**PHOTOGRAPHY BY TRISTAN SPINSKI**

Text by Jenny McKee

📷 Sooty Terns and noddies have claimed a portion of Johnston's 596 acres as nesting grounds. The birds are highly sensitive to disturbance, as seen here when they temporarily shifted off their eggs as federal biologists passed by. President Calvin Coolidge declared Johnston a federal bird refuge in 1926 due to its remarkable abundance and diversity of seabirds. Eight years later, with World War II on the horizon, President Franklin D. Roosevelt placed the atoll under military control. For seven decades the armed forces undertook activities there ranging from nuclear weapons testing to chemical weapons storage and disposal. By 2004 the military had removed most of the infrastructure and turned Johnston over to the U.S. Fish and Wildlife Service to manage as a sanctuary for nesting seabirds.

📷 The FWS put the refuge off-limits to the public and instituted strict biosecurity protocols, and nature quickly began reclaiming the few vestiges of human activity, including the main road and hurricane-proof former Joint Operations Center (pictured). In 2010, however, biologists found that yellow crazy ants had made their way onto Johnston and were devastating Red-tailed Tropicbirds and other ground-nesting species. “It was like a horror movie,” says former FWS wildlife biologist Beth Flint. “They would swarm over any living thing on the ground.” The agency quickly launched an intensive effort to battle the ants.





📷 In 2014, when these photos were taken, the author (above center) led a crew for a six-month stint to combat the invasive insects (top). Birds were conspicuously sparse or absent across a large swath of the island, unable to withstand the biting, formic-acid-spraying ants, which blinded and maimed those that remained. Dressed in Tyvek suits and armed with spray guns filled with an enticing (to ants) mix of cat food, corn syrup, and insecticide, teams worked to stamp out the infestation. It took 11 years and 20 rotating crews of intrepid biologists, but by 2021 the FWS had eradicated the crazy ants—an unequivocal conservation success story. Today Johnston, the only landmass within 570,000 square miles of ocean, supports a bevy of nesting seabirds as well as migrating Bristle-thighed Curlews and Pacific Golden-Plovers. "This is a unique place," says Don Lyons, director of conservation science for Audubon's Seabird Institute, "an isolated piece of land surrounded by a very huge ocean, and thus offers a really unique opportunity for seabirds to nest." That makes Johnston a rare bright spot at a time when seabird populations across the globe are plummeting.

📷 Clockwise from top right: Birds nest and roost in the refuge year-round, including Brown Boobies, 300,000 Sooty Terns, 10,000 Red-footed Boobies, and about one-third of the world's Red-tailed Tropicbirds. The surrounding waters, part of the Pacific Islands Heritage Marine National Monument, host a plethora of ocean life, including 300 fish species and more than 50 types of coral. Now biologists and conservationists are concerned that development in the refuge could endanger the hard-won conservation gains. In March the U.S. Air Force announced plans to build two landing pads on Johnston that would operate commercial rockets for four years; construction could begin this year. (A 30-day public comment period is required before the project can advance.) The effort would require significant infrastructure and would destroy habitat, cause light and noise pollution, and open the door to invasive species, experts say. "People have fought to restore these fragile ecosystems," says Janith Taylor, a retired FWS biologist now with the National Wildlife Refuge Association. "We're on the edge of losing it all to commercial development." Adding to those worries is the potential to set a precedent for development in other refuges and monuments—places specifically set aside to protect ecological and cultural resources. For the time being, at least, Johnston is still such a sanctuary, where right now a multitude of seabirds are raising their young.

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**Culture** **Safeguarding the Sacred**
A Comanche-led conservation center takes on an increasingly urgent mission: protecting the birds revered by many Native American tribes while preserving traditions at the heart of their culture. *By Rachel Nuwer/Photography by Jon Cherry*

## 20

**Dispatch** **Small but Mighty**
Four decades after they were added to the endangered species list, Great Lakes Piping Plovers are gaining ground—but they're also facing new threats. *By Andy McGlashen/ Photography by Steve Jessmore*

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**Social Animals** **Coming to You Live!**
Bird feeders with cameras are connecting more people to the avian dramas playing out daily in their yards—and also to each other. *By Elena Passarello/Illustrations by Emily Renaud*

**Cover: A Piping Plover provides cover for a chick at Sleeping Bear Dunes National Lakeshore in Michigan. Photo: Steve Jessmore**

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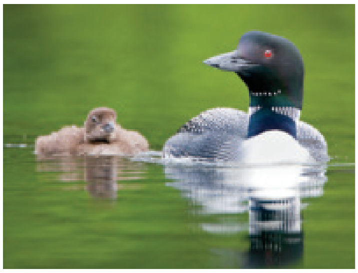
**Conservation** **Risky Business**
From the Arctic coast to the Tongass rainforest, Alaska's places of incomparable importance to birds and Indigenous communities now face lasting harm. *By Andy McGlashen and Alisa Opar*

PHOTOS CLOCKWISE FROM TOP RIGHT: JON CHERRY; FLORIAN SCHULZ; COURTESY OF NICK PASSARELLO; STEVE JESSMORE

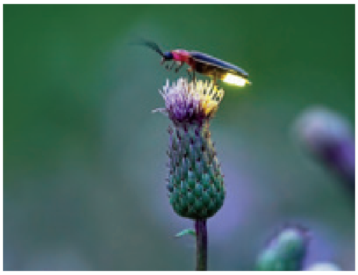
EDITOR'S NOTE



**8 AUDUBON VIEW**
Summer is the season to appreciate the landscapes most special to us—and all that we safeguard when we protect them. It speaks to a legacy that Audubon has continued for 120 years, and counting.

**11 INBOX**

**12 FIELD NOTES**
Job cuts on public lands; a day in the life of Mallards; policies that conserve water that birds and people need; a coastal comeback for oysters—and oystercatchers.



**50 FIELD GUIDE**
Seek out the season's glitziest wildlife, from iridescent hummingbirds to bioluminescent beetles. Or as the mercury climbs, stay home to engineer cooling stations for birds or take respite yourself with some engrossing new books.

**56 THE AVIARY**
Paper artist Roberto Benavidez crafts a tribute to the Ivory-billed Woodpecker through a striking piñata rich with symbolism.

PHOTOS CLOCKWISE FROM RIGHT: MIKE FERNANDEZ/AUDUBON; RADIM SCHREIBER; SYDNEY WALSH/AUDUBON; KEN CANNING/GETTY

# Strength to Endure

The work of conservation never ends—and neither does the perseverance of people who care.

BY JENNIFER BOGO, EDITOR-IN-CHIEF

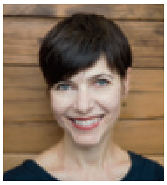
IN A 1940 ISSUE OF *AUDUBON* magazine, Ira N. Gabrielson—the first director of the newly formed U.S. Fish and Wildlife Service—marveled for 10 long pages at the great concentrations of birdlife in Alaska. Three years and several trips later, his byline appeared again, this time pondering a question: What effect would new roads, airstrips, and encroaching development have on Alaska's wildlife, and on the people who depend upon the land for their existence?

Gabrielson oversaw an expansion of the National Wildlife Refuge System across the United States, but it would be many more decades—and many more *Audubon* stories—before Alaska saw robust protections through a combination of national refuges, forests, parks, and other designations. And yet here we are in 2025, once again examining the question he posed—only with more urgency. As we report in "Risky Business" (page 42), proposals to develop Alaska's irreplaceable ecosystems are gaining momentum, including roads that would open key migratory bird habitats to development.

Early Audubon members pressed for the first national wildlife refuge, Florida's Pelican Island, in 1903, and even paid the salary of the first manager (it was $7 a month). Over its 120-year history, the national organization secured many more conservation wins, but if history has shown us anything, it's that progress takes vigilance to maintain. The vibrant seabird colonies making Johnston Atoll home, as seen in this issue's opening photo essay, reflect dogged efforts to rid the island of invasive ants. And the Great Lakes' "Small but Mighty" Piping Plovers (page 20) are rebounding thanks to tireless crews who band, monitor, and rear baby birds.

The staff who provide key services for the nation's public lands—biologists, park rangers, land managers, and others—play an integral role in these and other efforts. And so it's with concern that we also share "Skeleton Crew" (page 12), which details the deep cuts to the federal workforce now compromising agencies' ability to fulfill their missions. The careful reader will see these cuts playing out across multiple stories in this issue.

Gabrielson once wrote that "persistency in the conservation movement is essential," and that preserving its successes will require education and public pressure "for all time to come." Thankfully, the scientists, birders, local leaders, and others who care enough to speak out for our natural resources show no signs of letting up. Ⓐ

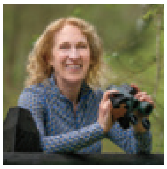


> If history has shown us anything, it's that progress takes vigilance to maintain.

# Power of Place

From placid lakes to craggy coasts, the habitats we protect shape the lives of birds—and our own.

BY ELIZABETH GRAY, PH.D.
CHIEF EXECUTIVE OFFICER



Each of these landscapes reminds us how much hangs in the balance.

A Common Loon and its chick on Lake Winnipesaukee in New Hampshire

EVERY SUMMER, I RETURN WITH my family and my siblings' families to Lake Winnipesaukee in New Hampshire. It is a place we know by heart—where we spend a week living simply, in nature, surrounded by forests and water. Mornings begin with the call of a Common Loon echoing across the water—always the first sound I listen for. Later in the day, the drumming of a Pileated Woodpecker might carry through the trees. It is a place that reminds me how much birds belong to the places that shape them—and how much we do, too.

It is not a remote wilderness or a protected refuge. But it is a place that holds memory, meaning, and connection. And it reinforces the urgency of protecting places like it across the hemisphere—because when we protect a place, we are protecting all the life it sustains.

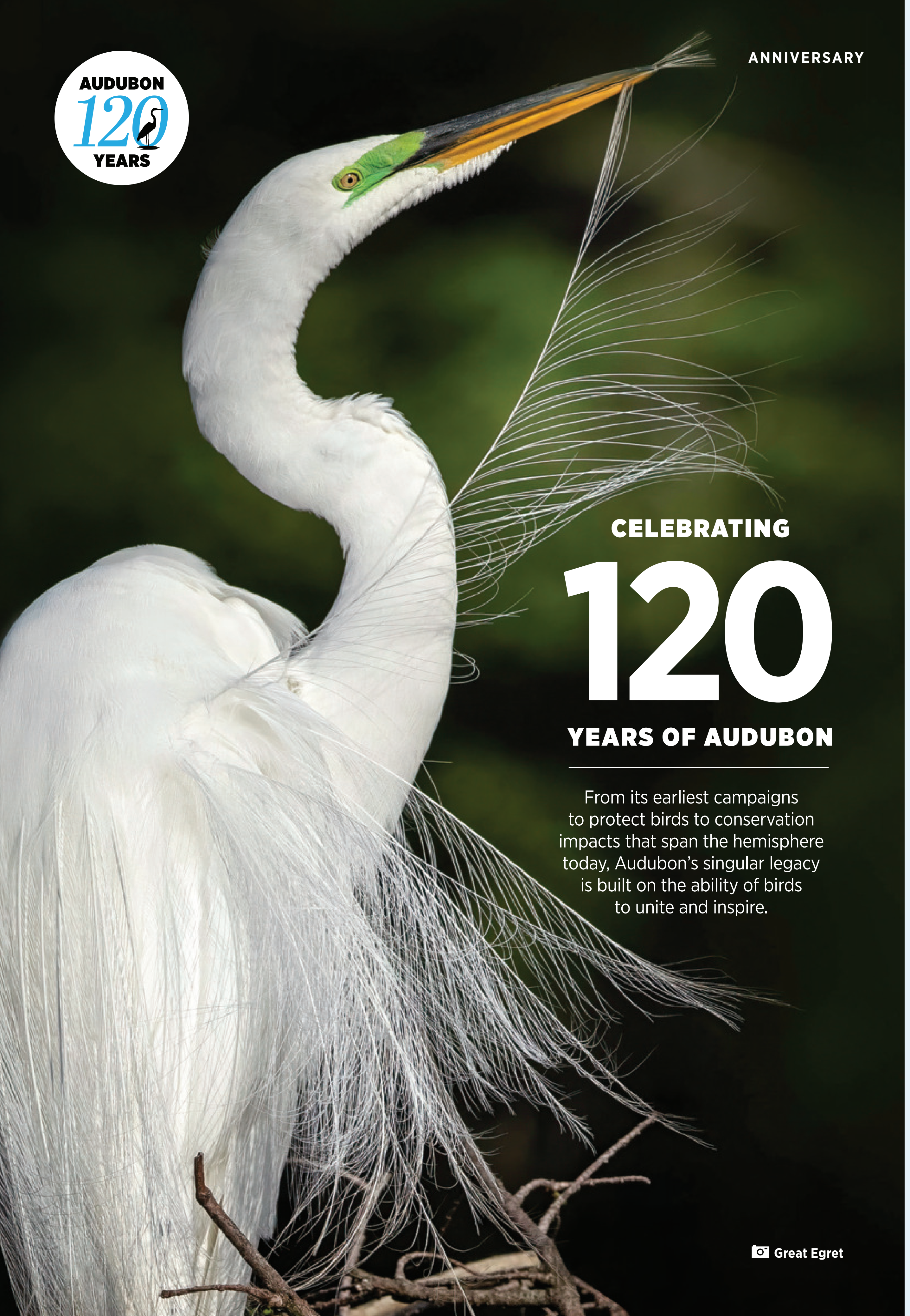
At Audubon, our mission is to protect birds and the places they need, today and tomorrow. I think about that every day—and I often find myself coming back to "the places." Because it is in the specificity of place—coastal dunes, wide-open grasslands, remote tundra—that our work becomes real. Birds do not exist in the abstract. They need intact marshes to feed their young, tree canopy to hide their nests, open skies to follow the maps etched into their DNA.

This issue includes stories about some of those places: a stretch of shoreline along the Great Lakes where Piping Plovers are making a comeback; a remote corner of Oklahoma where eagle feathers are protected with reverence; a fragile Arctic landscape that, if lost, could never be reclaimed. These places are as varied as the species that depend on them. Yet they share a fundamental truth: Conservation is grounded in science, in the earth beneath our feet, in the waters that sustain life, and in the people who care enough to protect them.

As Audubon celebrates its 120th anniversary, each of these landscapes reminds us how much hangs in the balance. One storm can wash away a nesting colony. One shortsighted decision can erase a habitat that took centuries to form. These moments of loss are real—and often they are irreversible. That is why we do this work. Because we still have a chance to hold on to what matters. To protect what cannot be replaced.

And when we succeed—when we set aside a refuge, restore a wetland, or bring a species back from near extinction—we are not just saving birds. We are safeguarding the places that shape our own stories, too. Ⓐ

PHOTOS FROM TOP: JAIR F. COLL; KEN CANNING/GETTY



AUDUBON
120
YEARS

## CELEBRATING 120 YEARS OF AUDUBON

From its earliest campaigns to protect birds to conservation impacts that span the hemisphere today, Audubon's singular legacy is built on the ability of birds to unite and inspire.

Great Egret

Bird walks in New York's Central Park and elsewhere reflected a growing fascination with birds in the 1940s.

## LOOKING BACK: IT ALL BEGAN WITH BIRDS

**IN THE LATE 1800S CONCERN FOR BIRDS** was mounting. Millions were being slaughtered each year for market hunting and the millinery trade. To turn public sentiment in favor of protecting wild birds, in 1886 *Field and Stream* editor George Bird Grinnell formed the first Audubon Society. Within a year some 40,000 people had joined, but the rapid growth proved too much to maintain. By 1889 the group had ceased to exist—and then two women picked up the cause.

Cousins Harriet Hemenway and Minna B. Hall launched the Audubon movement that would endure. Disturbed by the destruction of heron rookeries, in 1896 they urged Boston women to eschew feathered hats and join a society for the protection of birds. Thousands did, and more societies formed. Harnessing their political power, Audubon members successfully pressed for a groundbreaking law: the Lacey Act, which in 1900 became the first federal legislation to protect wildlife. By 1905 Audubon societies had formed in 35 states, one territory, and the District of Columbia, and that year they formed a national association to strengthen the movement's progress.

From the start, Audubon's success has been built on everyday people doing extraordinary things. And in its first 50 years alone, the National Audubon Society helped pass some of the nation's strongest laws to protect birds, initiated a robust sanctuary system, collaborated on cutting-edge research, and launched nature-education programs across the country. "It is truly remarkable how much progress has been made in so little time," Audubon president John Baker reflected in 1955. While lauding the stamina, persistence, and determination required to keep forging ahead toward the organization's goals, Baker recognized that subsequent generations would no doubt face new challenges. "The need for conservation," he said, "goes on forever."

> *"It is truly remarkable how much progress has been made in so little time."*

PHOTOS FROM LEFT: ROBIN LACICERO/AUDUBON PHOTOGRAPHY AWARDS; CHARLES H. COLES/AMNH SPECIAL COLLECTIONS; MIKE FERNANDEZ/AUDUBON

## LOOKING AHEAD: A POWERFUL FORCE FOR CONSERVATION

**TODAY BIRDS CONNECT AND INSPIRE** people at a scale unimaginable in the early 20th century. And Audubon has grown into a hemispheric organization with nearly 2 million supporters, 415 community chapters, and 92 campus chapters, and it has expanded its work into 11 countries.

> *"We are building on our rich history to arrive at this moment equipped for the future."*

The challenges facing the planet have also never been greater, and birds continue to act as important sentinels of its health. Nearly 3 billion birds have vanished from North America since 1970, as habitat loss and climate change have transformed ecosystems that both birds and people rely upon. In order to reverse this precipitous decline and bend the bird curve back upward, Audubon has expanded its commitment to conservation beyond U.S. borders and aligned its work along the migratory flyways that millions of birds travel seasonally.

Harnessing science, Audubon is tracking birds on their hemispheric journeys to identify the places they need and the threats they encounter along the way. Following the vision charted in Flight Plan, Audubon's strategic plan, the organization is partnering to protect and conserve 300 million acres of connected, climate-resilient habitat—stretching from Chile to Canada and Alaska—in the process strengthening the resilience of human communities as well. And to address the growing threat of climate change, Audubon is working to accelerate the transition to renewable energy and to help store billions of tons of carbon in forests, wetlands, and grasslands, a natural solution for slowing the effects of climate-altering greenhouse gases.

Audubon's aims are ambitious—crucially so. "We are building on our rich history to arrive at this moment equipped for the future, as a powerful, ever-growing force for conservation," says Audubon CEO Dr. Elizabeth Gray. "We are working to halt, and ultimately reverse, the decline of birds across the Americas and realize a future where birds and people thrive."

Audubon partners with Colombian scientists to track Blackpoll Warblers on their long-distance migrations.

# FOR 120 YEARS AUDUBON HAS RECOGNIZED THE POWER OF BIRDS TO DRIVE CONSERVATION, A LEGACY IT CONTINUES TODAY.

**1905**
Two decades of grassroots action to stop the slaughter of birds, propelled by advocates like Harriet Hemenway (below), culminate in the incorporation of the **National Association of Audubon Societies.** The organization, later renamed the National Audubon Society, locates its headquarters in New York City, then the center of the feather industry.

**1910s**
**Junior Audubon Clubs** take off. Among the millions of schoolchildren who join and learn about birds over the next several decades is Roger Tory Peterson (below), who goes on to revolutionize birding with his illustrated field guide and inspire other young conservationists as Audubon's education director and art director of its magazine.

JUNIOR MEMBER
NATIONAL AUDUBON SOCIETY

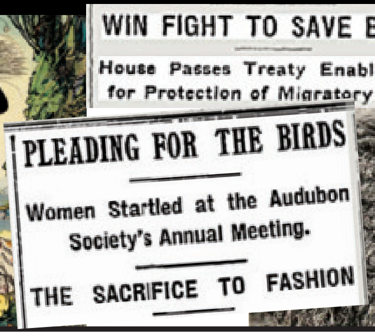
**1923**
Theodore Roosevelt Sanctuary in New York becomes the first of 29 **nature sanctuaries,** followed by Rainey Sanctuary in Louisiana. Over decades Audubon's system grows to include the last great stand of bald cypress in Florida's Corkscrew Swamp (right).

**1923**
Audubon hires a **coastal warden** to protect nesting birds on Texas's Green Island, beginning a legacy of shorebird conservation now carried out by Audubon staff and volunteer beach monitors across the country.

## Lasting Protection Starts Strong

Public pressure spearheaded by Audubon led to the passage of the **Audubon Plumage Law** in New York in 1910; it struck at the heart of the millinery trade and offered a template for other states. A federal milestone followed in 1918 when the **Migratory Bird Treaty Act** became law, enforcing an agreement to protect birds that migrate between the United States and Canada. Audubon leader T. Gilbert Pearson helped persuade the U.S. government to sign the act by suggesting an amendment that broadened its appeal: Extend protections beyond game birds to all migratory birds, including dickey birds, small songbirds popular with homeowners and farmers. Since then Audubon has worked to protect and strengthen the Migratory Bird Treaty Act, including through provisions that provide stability to both birds and business.

1905


WIN FIGHT TO SAVE BIRDS.

House Passes Treaty Enabling Act for Protection of Migratory Game.

PLEADING FOR THE BIRDS

Women Startled at the Audubon Society's Annual Meeting.

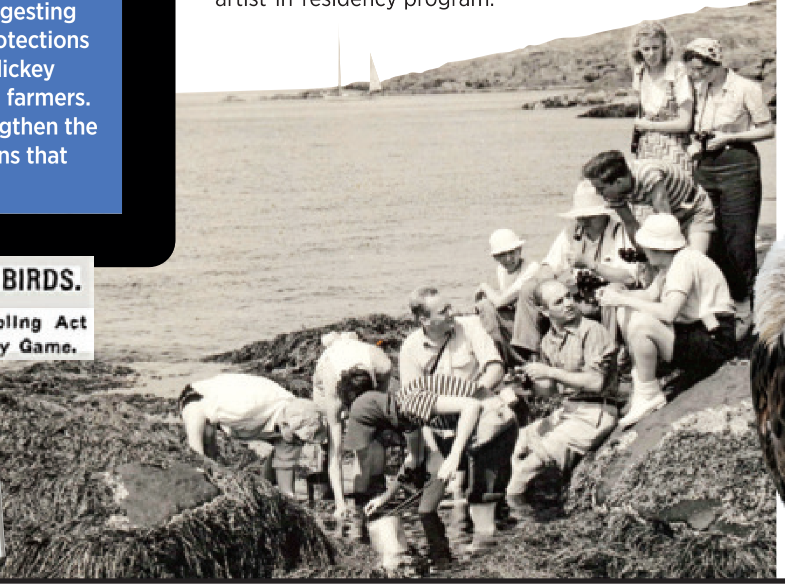
THE SACRIFICE TO FASHION

Kybosh
D-D-T
FLY and MOTH
SLAYER

1955

**1943**
A new **Audubon center** in Greenwich, Connecticut, welcomes visitors to explore its woods and meadows and learn about nature. It's the first of 33 Audubon centers that today provide places for people to connect with birds and the natural world.

**1936**
Audubon opens a nature camp for teachers on Maine's **Hog Island** (below), envisioning that they'll spread interest in conservation. In time sessions expand to serve teens, photographers, families, and more, and the camp now offers a thriving artist-in-residency program.

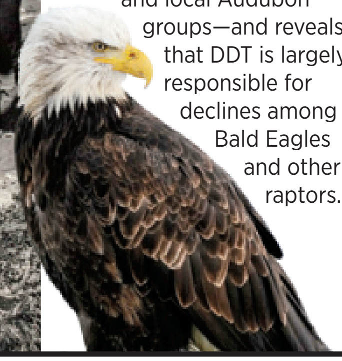


**1945**
Audubon sounds the **first alarm about DDT** in its magazine, and soon after, the organization calls for research into the insecticide's ecological effects. The same year, Audubon partners with the U.S. Fish and Wildlife Service to start the **Whooping Crane Project,** which through an education campaign and trailblazing science helps cranes recover from a couple of dozen birds to some 600 flying free today.

**1953**
Audubon adopts the **Great Egret,** one of the chief victims of the turn-of-the-century plume hunters, as its symbol. Members are encouraged to purchase a $1 cloth patch with the mascot and sew it onto a shirt or jacket: "Wear your emblem proudly and tell everyone who inquires about it of the history and present work of your Society."

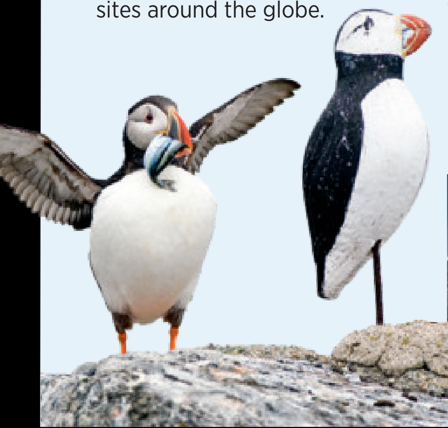
NATIONAL AUDUBON SOCIETY

**1961**
Amid alarming signs that the nation's symbol is in trouble, Audubon launches the **Continental Bald Eagle Project.** The five-year cooperative research program enlists a broad array of partners—including federal, state, and provincial wildlife agencies; ornithological societies; and local Audubon groups—and reveals that DDT is largely responsible for declines among Bald Eagles and other raptors.



**1972**
The U.S. Environmental Protection Agency **bans the use of DDT** after a campaign by Audubon and the Environmental Defense Fund successfully channels public concern spurred by Rachel Carson (left) into conservation action.

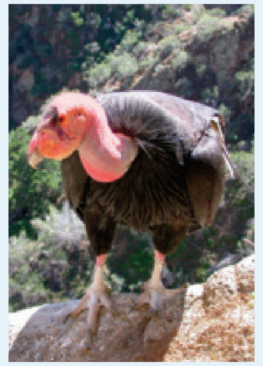
**1973**
In an unprecedented effort to restore historic seabird nesting colonies, Audubon launches **Project Puffin.** Its pioneering social attraction methods bring Atlantic Puffins back to southern Maine, and scientists eventually use the techniques with one-third of all seabird species at more than 500 sites around the globe.



2000

## Community Science Gains Momentum

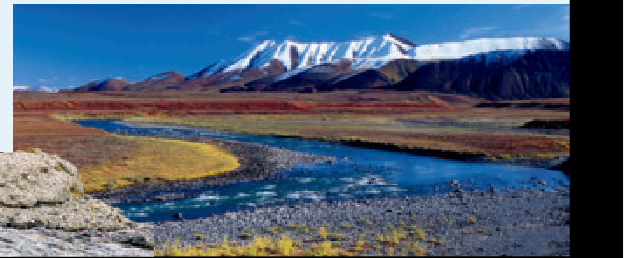
Since its inception 125 years ago, the **Audubon Christmas Bird Count**—the world's longest-running avian survey—has grown to include more than 83,000 volunteers in 21 countries, including Colombia (right). More than 800,000 global participants now join the **Great Backyard Bird Count,** started by Audubon in 1998, logging data that help scientists better understand avian populations in the period just before migration. And the **Lights Out** program established by Audubon and partners in Chicago in 1999 was the first of 50 such efforts to dim night skies in cities each fall and spring—initiatives supported by volunteers collecting data to document deadly bird-building collisions.



**1973**
Audubon helps pass the **Endangered Species Act,** considered the nation's strongest wildlife law, kicking off more than five decades of sustained advocacy for maintaining and strengthening protections for hundreds of threatened and endangered species.

**1987**
Audubon biologists help capture the last wild **California Condor** (left)—an audacious gambit to save the species through captive breeding that eventually pays off, with more than 300 birds now roaming in five flocks across California, Arizona, Utah, and Baja California, Mexico.

**1980**
Harnessing its powerful grassroots policy approach, Audubon builds support for the Alaska National Interest Lands Conservation Act. The legislation protects 79.3 million acres, including the **Arctic National Wildlife Refuge** (below), where more than 200 bird species from six continents breed and stop over.



## Hemispheric Partnerships Take Flight

In 2018 Audubon launched the **Migratory Bird Initiative,** a pioneering collaboration that pools research on birds like the Blackpoll Warbler (right) to paint the fullest picture yet of the awe-inspiring phenomenon. Audubon's **Boreal Conservation** program has since 2019 supported Indigenous-led efforts with the potential to protect millions of acres of critical bird habitat in Canada. And the organization helped form **Conserva Aves** in 2021 to establish more than 100 new protected areas in Latin America and the Caribbean to the benefit of communities and 1,200 bird species; the partnership between Audubon, BirdLife International, Birds Canada, American Bird Conservancy, and RedLAC has now safeguarded more than 4.3 million acres.

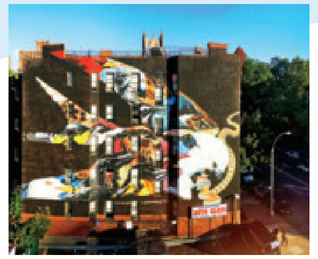
2025

**2010**
Audubon announces the winners of the first **Audubon Photography Awards**—a contest that inspires audiences to look at birdlife through a new lens. In 2025 it expands to residents of Chile and Colombia as well.

**2004**
Audubon's science team releases **State of the Birds,** reporting that nearly 30 percent of U.S. bird species are in significant decline. The North American Bird Conservation Initiative then begins to issue the landmark report regularly.

**2000**
With Audubon at the forefront, the **Everglades Protection and Restoration Act** becomes law. At a cost of $10.5 billion over 35 years, it's the nation's largest hydrologic restoration project and one of vital importance for wading bird populations.

**2014**
Audubon's first **birds and climate change report** forecasts that, by 2080, hundreds of bird species in North America could be vulnerable to extinction due to habitat loss from rising temperatures. That same year the **Audubon Mural Project** launches, using public art to call attention to the report's findings.



**2017**
Missouri's Round Rock Ranch becomes the **Conservation Ranching** program's first Audubon Certified Bird-Friendly Land. With a unique market angle that connects consumers to conservation on working lands, the effort grows to 100 ranches and farms and nearly 3 million acres.

**2018**
To train and support the next generation of conservationists, Audubon launches the **Audubon on Campus** program at colleges and universities; today 92 chapters thrive in 37 states.

**2022**
Audubon unveils the **Bird Migration Explorer,** an interactive online platform with visualizations of more than 450 species' journeys and the challenges they encounter throughout the year.

**2025**
The **Americas Flyways Initiative,** which Audubon cofounded to address the dual crises of biodiversity loss and climate change, begins implementing its vision to fund nature-based solutions through major economic development projects—aiming to mobilize billions of dollars to protect more than 30 landscapes and seascapes.

PHOTOS TOP HALF, FROM LEFT: COURTESY OF MASS AUDUBON; AUDUBON (2); ALLAN D. CRUICKSHANK FROM NATIONAL AUDUBON SOCIETY; AMORET TANNER COLLECTION/SHUTTERSTOCK; EVERETT COLLECTION/BRIDGEMAN IMAGES; DERRICK Z. JACKSON/AUDUBON PHOTOGRAPHY AWARDS; ALLAN MEE; STEVEN KAZLOWSKI/ALASKA STOCK; MIKE FERNANDEZ/AUDUBON

PHOTOS BOTTOM HALF, FROM LEFT: GORDON ROSS/LIBRARY OF CONGRESS; THE NEW YORK TIMES (2); ALLAN D. CRUICKSHANK/COURTESY OF FRIENDS OF HOG ISLAND; ERIC ASHMAN/AUDUBON PHOTOGRAPHY AWARDS; AUDUBON; LUIS BERNARDO CANO; MIKE FERNANDEZ/AUDUBON; SYDNEY WALSH/AUDUBON; AUDUBON

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Swinhoe's White-eye

**New Bird Alert** Birders on the West Coast have recently had to add a new species to their mental field guide: the Swinhoe's White-eye. Native to Asia, these small yellow songbirds were accidentally introduced to Southern California in 2007, but in the past decade, their population has exploded, spreading from Seattle to Baja. The boom has surprised experts, who recently discovered that the white-eyes are moving into areas climatically different from their home range—suggesting that their U.S. expansion might just be getting started. Read more at **audubon.org/whiteeyes**.

### RE: "The 'Forever' Fallout"

The Spring 2025 cover story about the contamination of PFAS, also known as "forever chemicals," in North Carolina's Cape Fear River shined a light on the risks to wildlife and local residents. "The molecules in our environment are constantly recirculating, so of course PFAS molecules stay here, too," wrote reader **CHRIS JONES**. "This excellent article highlights many dangers, but perhaps the biggest is to fertility. PFAS and other molecules found in various plastics are known endocrine disruptors. We must stop the production of PFAS. We must also collect and isolate these toxins that are already in the environment. If we don't, we will eventually ensure our own extinction, along with countless other species." Meanwhile, **GEORGE BERGMAN** had a grammatical query: "The article was interesting and concerning to read! But I am writing about a trivial question: How do you pronounce PFAS when it is used in the plural?"

*Editor's Note: George, as word people, we love this question! Associate Editor Maddie Burakoff, who reported this piece, notes that the "S" in PFAS (PEA-fass) stands for "substances," so the pronunciation is inherently plural.*

**Send letters to audubonmagazine@audubon.org.**

### RE: "Banking on a Bird"

"Many thanks for an outstanding issue and 'Banking on a Bird,' your spectacular feature about the role of reclaimed prairie grasslands in preserving and enlarging habitat for the endangered Lesser Prairie-Chicken," wrote reader **EILEEN VIZCAINO**, who went on to praise the "photography and in-depth research. It evoked memories of stories my dad told about growing up on the Saskatchewan prairie."

### RE: "Make the Leap to Leading"

Our Field Guide primer on how to lead a group birding trip sparked an enthusiastic endorsement on Facebook. "Leading bird outings is by far the best way to grow your birding skills quickly," commented **ALISON KONDLER**. "In my 20s, I was a naturalist and knew how to lead groups, but I was a beginner at birding. Luckily, there was always someone who knew more about birds than me. The pressure was intense, but all the ID mistakes in front of others forced me to learn faster than I ever could have on my own. If you get the chance to lead, even before you feel ready, take it!"

*Correction: In our Spring 2025 story "Bird Sits Are Big Fun," we mistakenly used the term "Big Sit," which is a registered trademark of the New Haven Bird Club for use in connection with an international birding event. To learn more, please visit thebigsit.org. We regret the error.*

**What the Neck?** Ever wondered why herons have such long necks? Or how they swallow food whole? We've got answers to these questions and more at **audubon.org/heronnecks**.

PHOTOS FROM TOP: SWINHOE'S WHITE-EYE, BRYAN BOX/INATURALIST CC BY-NC; BROWN PELICAN, MADELINE GRAY; TRICOLORED HERON, GAMZE QUICK/AUDUBON PHOTOGRAPHY AWARDS

# FIELD NOTES

VOID

## Skeleton Crew

Layoffs and uncertainty in the federal workforce could cause lasting damage to public lands.

BY MADDIE BURAKOFF

WHEN THE U.S. GOVERNMENT started setting aside public land more than 150 years ago, its goal was twofold: to protect the scenery and wildlife of these special places and to allow people to enjoy them, long into the future.

For decades, though, land management agencies have struggled to fulfill that mission as Congress has trimmed their funding, leaving them understaffed. The National Park Service lost 20 percent of its workers between 2010 and the end of 2024, even as the number of visitors climbed to a record 332 million last year. Staffing at national wildlife refuges, managed by the U.S. Fish and Wildlife Service, shrank 30 percent in the same period.

Now the Trump administration's deep cuts to the federal workforce have turned those familiar challenges into a full-blown crisis, advocates say. "The fat is gone. The muscle is gone," says Desirée Sorensen-Groves, president and CEO of the National Wildlife Refuge Association. "They're a skeleton now, and you're losing the bones."

The onslaught began on Valentine's Day, when the so-called Department of Government Efficiency (DOGE) ordered layoffs for employees who had recently been hired or changed roles. Thousands at the NPS, FWS, Bureau of Land Management, and Forest Service were cut, regardless of their job performance or duties. Thousands more at those agencies have reportedly accepted early retirement offers. Meanwhile, a hiring freeze delayed recruitment of seasonal staff for the busy summer months. "It's going to take years, if not decades, to recover from some of the damage that's being done right now to the national parks and other public lands," says Bill Wade, executive director of the Association of National Park Rangers.

> "It's going to take years, if not decades, to recover from some of the damage that's being done."

Some employees were reinstated after courts deemed their firings illegal, but uncertainty still hangs over the agencies. "Everybody's in flux," says Elaine F. Leslie, a retired NPS biologist with the Coalition to Protect America's National Parks. "From day to day, they don't know if they have a job."

Travelers felt the impacts this spring. Parks shut down visitors' centers, trails, and campgrounds, and people complained of piled-up trash, long entry lines, and bathrooms with no toilet paper. Summer visitors may see relief as rehired and seasonal staffers come on board, but it still won't be business as usual, says a current NPS worker, who requested anonymity to protect their job.

The ecological effects may take longer to understand—and be harder to repair. "We can reopen a building tomorrow," says Russell Galipeau, former superintendent of Channel Islands National Park, who retired in 2018. "We may not be able to bring a species back tomorrow." Supporting wildlife on public lands requires constant work, whether that's treating California Condors for lead poisoning or managing water levels for Whooping Cranes. Even brief interruptions can cause lasting damage, Leslie says. According to news reports, the February layoffs included a biologist who was so dedicated to restoring habitat for the imperiled Attwater's Prairie-Chicken that she volunteered at the refuge after she was fired.

Federal employees also work to reduce wildfire risk and fend off invasive species, from Burmese pythons that devour wading birds in the Everglades to feral hogs whose wallows help spread avian malaria in Hawaiian forests. Once invasives gain a foothold, "they can take over an ecosystem so fast," Sorensen-Groves says. "Our native species won't have a chance."

Disruptions to monitoring could also make it hard for scientists to know how species are faring. "They could just go extinct tomorrow, because nobody is paying attention," Leslie says. Researchers have warned that Spotted Owl monitoring will be greatly reduced this year, even though it's required under federal forest management plans and essential for gauging population health.

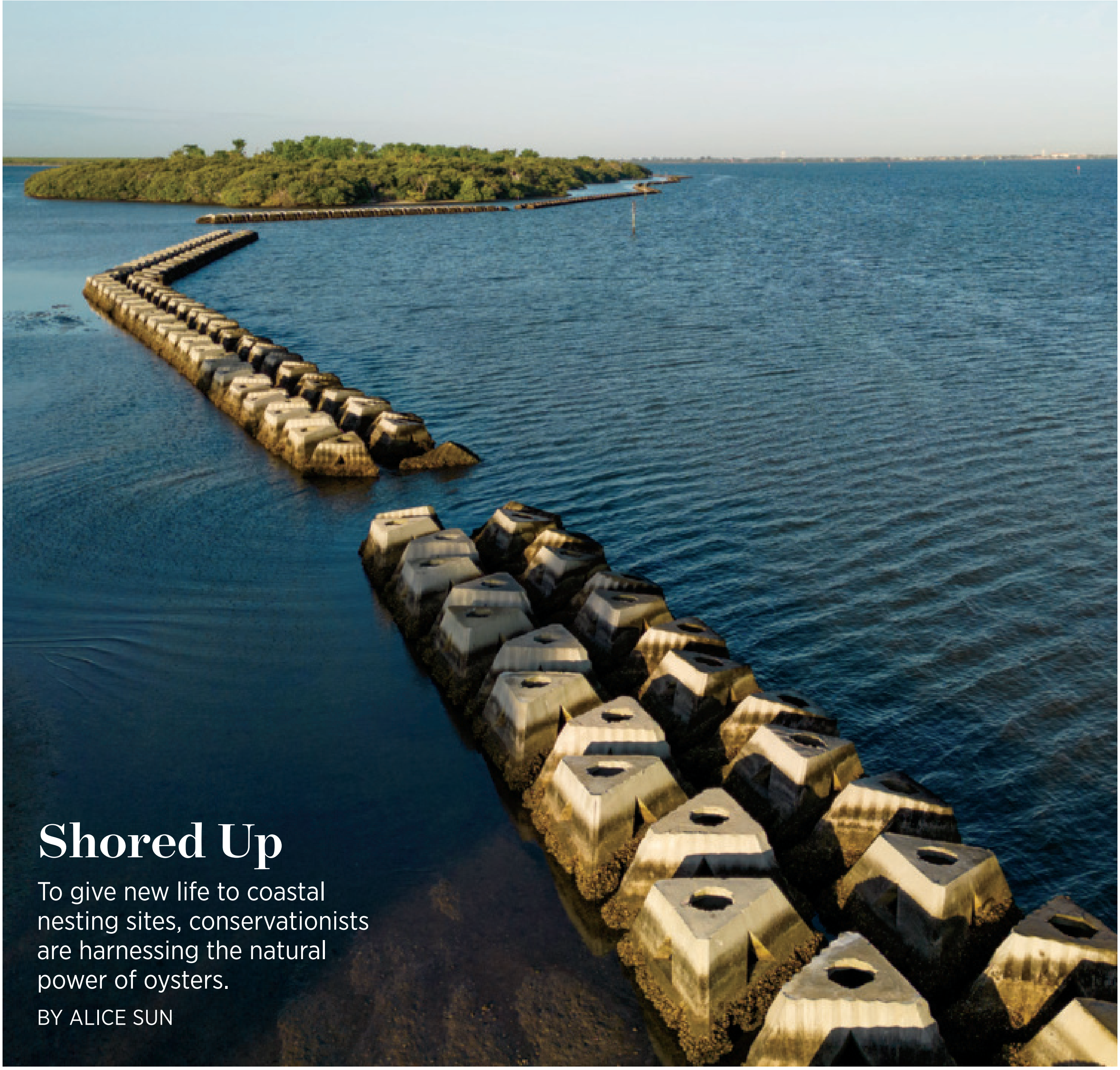
The layoffs have struck a nerve among Americans of all stripes who care deeply about public lands. Among other benefits, national parks and refuges generate billions of dollars each year for nearby communities. Since the initial layoffs, protesters have gathered to support public lands across the country—from Yellowstone, the world's first national park, to Chuckwalla National Monument, just designated in January. Elected officials from both parties have also spoken out against DOGE's far-reaching cuts.

Meanwhile, workers still on the job are determined to uphold public lands' original promise. "We care so, so deeply for these parks, and we work to ensure that they will still be there for the next generation and all those to come," the NPS employee says. "We will never stop fighting for the parks we love." Ⓐ

📷 **Many people have rallied to support public lands, including Chuckwalla National Monument's vital desert habitat (pictured).**

ILLUSTRATION BY FELIX SOCKWELL

PHOTOGRAPH BY MIKE FERNANDEZ/AUDUBON



# Shored Up

To give new life to coastal nesting sites, conservationists are harnessing the natural power of oysters.

BY ALICE SUN

PHOTOS FROM LEFT: SYDNEY WALSH/AUDUBON; LINDSAY ADDISON/AUDUBON; WALKER GOLDER

THE TWIN ISLANDS OF ALAFIA Bank were washing away. The state-designated bird sanctuary, whose sandy shores sit just above sea level in Florida's Tampa Bay, offers a haven for more than 10,000 nesting pairs consisting of 17 different bird species, including Roseate Spoonbills and Reddish Egrets. But every year, some of the islets' mangrove trees would topple as boat wakes, storms, and rising seas eroded the coast. In the 1980s, conservationists strapped thousands of donated tires together and placed them along the beach to stop waves from eating away at the shore, says Jeff Liechty, sanctuary manager with Audubon Florida. But the rubber barriers later broke apart.

So, in 2011, Audubon Florida, which leases and co-manages the site with The Mosaic Company and Port Tampa Bay, tried a different approach: lining more than a mile of shore with hollow concrete structures. The devices, which have holes to let water and sea life through, are designed to dampen wave impacts and attract some hardworking coastal residents—oysters. Within a year, mollusks covered the concrete, turning the breakwater into "a big buffet" for birds, Liechty says.

**Rebuilding oyster reefs at Florida's Richard T. Paul Alafia Bank Sanctuary (above) and North Carolina's Cape Fear River (opposite).**

It's just one of a growing number of projects harnessing the power of oysters to restore coastal ecosystems. Given the right material, oysters build complex reefs. These natural formations, once abundant along North American coasts, began to disappear toward the end of the 1900s due to development, dredging, and overharvesting. About 80 percent of the world's oyster reefs have now been lost, leaving coastal habitats vulnerable to erosion and climate change.

Today, recreating these natural barriers has become a popular alternative to other human-built breakwaters like concrete seawalls, which can do ecological damage and have failed to keep up with sea level rise and more extreme storms. NOAA has funded dozens of such "living shorelines" across the country and aims to wrap up the world's largest oyster reef restoration in the Chesapeake Bay this year. "Oysters are nature's architects," says Bethany Carl Kraft, Audubon's senior director for coastal and marine resilience. "In the last couple of decades in particular, we've seen this resurgence of interest in not just protecting our shorelines from erosion, but also using the benefits of nature to do that work."

To rebuild reefs, engineers use various bases where baby oysters, called spat, can grow. In many waterways, these larvae naturally drift around and just need some solid material, usually other oyster shells, to start their next life stage. The concrete shapes at Alafia Bank feature ridges and divots that encourage spat to settle. In North Carolina's Cape Fear River, conservationists offered both hollow concrete "reef balls" and mesh bags filled with recycled oyster shells. Meanwhile, on New York's Staten Island, the state-led Living Breakwaters project used computer models to design a specific reef shape to blunt the area's unique wave patterns; a local nonprofit is now placing live oysters on the stone-and-concrete structures. "There's no one right way to do this. It's an evolving science," says Pippa Brashear, a resilience expert at SCAPE Landscape Architecture who worked on the New York reef.

Once infrastructure is installed, the benefits quickly start flowing in. The Cape Fear River reefs helped expand nesting habitat for species such as American Oystercatchers, which nest on piles of old shells, says Audubon North Carolina coastal biologist Lindsay Addison. Oysters also filter excess sediment and nutrients from the water, providing a healthier environment for fish. But the biggest benefit of the reefs is their ability to stop coastal erosion, Carl Kraft says. A 2011 study in Alabama found that adding natural breakwater reefs reduced erosion by 40 percent.

In Tampa Bay, recent severe weather put living shorelines to the test. Back-to-back hurricanes hit the area in late 2024, while Liechty was overseeing the construction of new oyster reef breakwaters around four more Audubon-managed sanctuaries. Once the storms passed, the results were clear: Along stretches of coast without the structures, wind and waves washed sand away. But on shores where new reef balls were already installed, mangroves still stood tall—a signal of resilience for birds' beachfront homes.

American Oystercatcher

## Shelling Out

**A big bet to reverse the decline of the American Oystercatcher is now paying off.**

With a long, powerful bill capable of splitting open shells that few birds can crack, the American Oystercatcher seems well equipped to find plenty to eat in its coast-hugging habitats.

In the early 2000s, though, scientists noticed oystercatchers' namesake food source was disappearing—and the shorebirds were following suit. By 2008 the species' main populations along the Atlantic and Gulf coasts had dropped 8 percent in five years, with only around 10,000 birds left. When the American Oystercatcher Working Group, a coalition of experts, asked the National Fish and Wildlife Foundation (NFWF) for help turning the tide, the grant maker requested something unexpected: a business plan.

Thinking of birds as "returns on investment" felt foreign at first, says Alex Wilke, a coastal scientist with The Nature Conservancy. But the conservationists soon saw the value of focusing on efforts that would get the most bang for their buck. The goal was ambitious: a 30 percent increase in oystercatchers over 10 years. To make it happen, the NFWF offered $5 million, matched by $5 million raised by the coalition. From Maine to Texas, more than 35 groups, including Audubon, signed on. Some took on egg-munching predators like mink and coyotes—trapping them and testing deterrents like foul-tasting fake eggs. Others rebuilt reefs and elevated coastal nesting sites to shield them from flooding, or educated beachgoers about keeping nests safe.

Fifteen years in, the collaborative strategy is paying dividends. Scientists recently counted more than 14,000 American Oystercatchers in the East, a 43 percent leap that bucks the trend of shorebird declines. As rising seas, stronger storms, and funding uncertainties threaten hard-won gains, the collective effort may be more important than ever: "We definitely can't let our guard down," Wilke says. *—Jasper Davidoff*

# Mallards in Motion

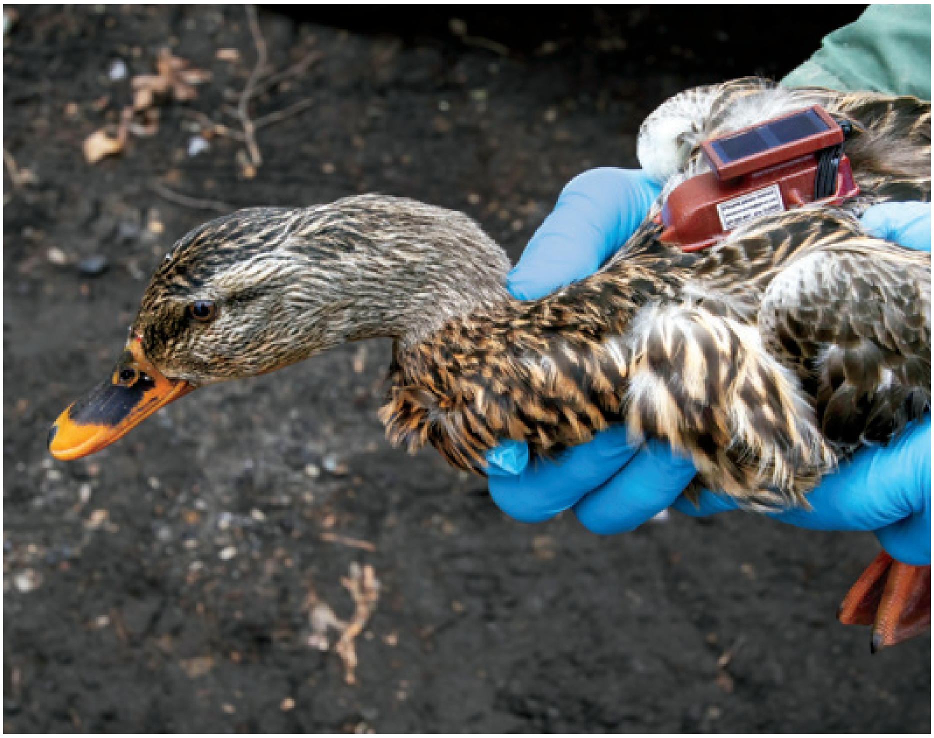
Biologists are using familiar health-tracking technology to unlock the mystery of why our most common duck is declining.

BY JENNY MCKEE

Mallards seem to be everywhere. They gather in parks and ponds, forage in farm fields, and even nest in urban planter boxes. This flexibility has helped make Mallards the most common ducks in North America.

And yet, while waterfowl populations overall have grown in the past few decades, Mallard numbers have declined by an estimated 20 percent since 1998, according to annual surveys. In the stretch of the Atlantic Flyway from New Hampshire to Virginia, the losses have been more than twice that. For such an adaptable species to undergo such a precipitous drop is troubling, says John Coluccy, director of conservation planning at Ducks Unlimited. “It indicates that something’s going on that we need to be paying attention to.”

> For such an adaptable species to undergo such a precipitous drop is troubling.



A female Mallard fitted with a tracking device provides valuable data on nesting behavior.

PHOTO: TROY GIPPS/MASSWILDLIFE

In 2021, seeking to understand the trend and find ways to reverse it, scientists launched the Atlantic Flyway Migration Project, an expansive research effort spanning 14 states and 3 Canadian provinces. The undertaking is ambitious both in its scale—22 government, university, and nonprofit organizations are involved—and in the sheer quantity of information it aims to amass: tens of millions of data points, when all is said and done. “It is truly remarkable,” says Mitch Weegman, a University of Saskatchewan biologist who co-leads the project. “It’s not common that you have several hundred people working on the same problem.”

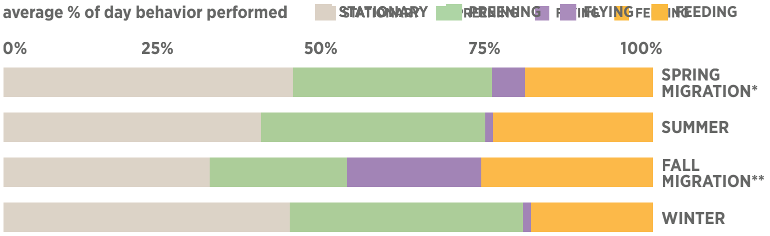
The goal is to create an extraordinarily detailed picture of Mallard behavior and see how decisions made by individual birds—such as when and where to migrate or build a nest—might contribute to falling reproduction. To do so, the biologists turned to the same behavior-tracking technology many people use to monitor their health. Just as smartwatches help gauge our sleep and trace our daily activity, transmitters affixed to the ducks provide updates on each bird’s activity every 10 minutes. So far the team has put trackers on nearly 1,200 Mallards, tagging only females to follow their nesting behavior. Weegman says he’s unaware of any other animal study that has netted such a staggering volume of data from so many individuals.

Capturing and tagging all those birds was no small feat—and it was just the first step. Next the scientists had to figure out what the movement data meant. To translate the squiggles and dots from the transmitters into real-life Mallard behaviors, University of Saskatchewan graduate student Cassidy Waldrep used computer models to identify patterns that indicate when a tagged bird is flying, feeding, preening, or resting. The team is confident that the models are accurate because they’ve observed tagged Mallards in captivity to ensure that their reading of the

## THIS DUCK'S LIFE

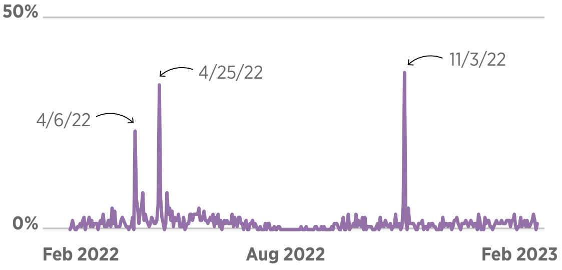
The transmitter that Mallard 2167-56872 began wearing in February 2022 provides a window into her daily activities over the course of a year. It's one of some 1,200 trackers helping scientists monitor eastern Mallards to identify drivers of the downswing.

### ONE BIRD, FOUR SEASONS



### INFREQUENT FLYER

The portion of each day she spends in flight spikes briefly during her seasonal migrations between Rhode Island and northern Maine.



*April 5 to May 1 and **November 2 to 3, based on this duck's daily activity

data matches the birds' behavior. In nesting season, they also use a drone with a heat-sensing camera to locate a small sample of tagged Mallards and confirm which transmitter patterns correspond to birds that are actively brooding.

Though it's too soon to say for certain what is causing the decline, one likely factor has emerged. Daria Sparks, a graduate student at SUNY Brockport, has found that a surprisingly high proportion of the tagged birds don't migrate. The team is still unpacking the reasons why, but evidence suggests the answer might involve genetics. Since the 1940s, sportsmen's clubs and others have released an estimated 1.8 million farm-raised Mallards for hunting. Today hybrid birds, the result of decades of domestic ducks mating with wild ones, make up more than 90 percent of the eastern Mallard population.

What's concerning are startling differences in behavior between wild and hybrid birds, revealed by 2022 research conducted in the Great Lakes region (which was unrelated to the Atlantic Flyway project). Compared to hybrids, the wild Mallards in that study were less likely to use urban environments, twice as likely to migrate, and three times more likely to incubate a nest. "It was pretty eye-opening as to how much those movement behaviors were related to bird genetics," says Benjamin Luukkonen, a biologist with the Michigan Department of Natural Resources who conducted the research as a graduate student at Michigan State University.

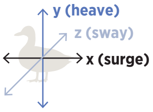
The Atlantic Flyway researchers plan to continue tracking Mallards through 2027, at which point they hope they'll be able to offer wildlife managers a clearer understanding of how to help the species recover. If birds that breed in rural marshes hatch more chicks than those in suburban parks, for instance, then restoring more wetlands could be a key strategy. Their findings may also help explain why Mallards that breed from Maine north into Canada continue to grow in numbers while their neighbors to the south dwindle—a disparity that could hold lessons for conservation.

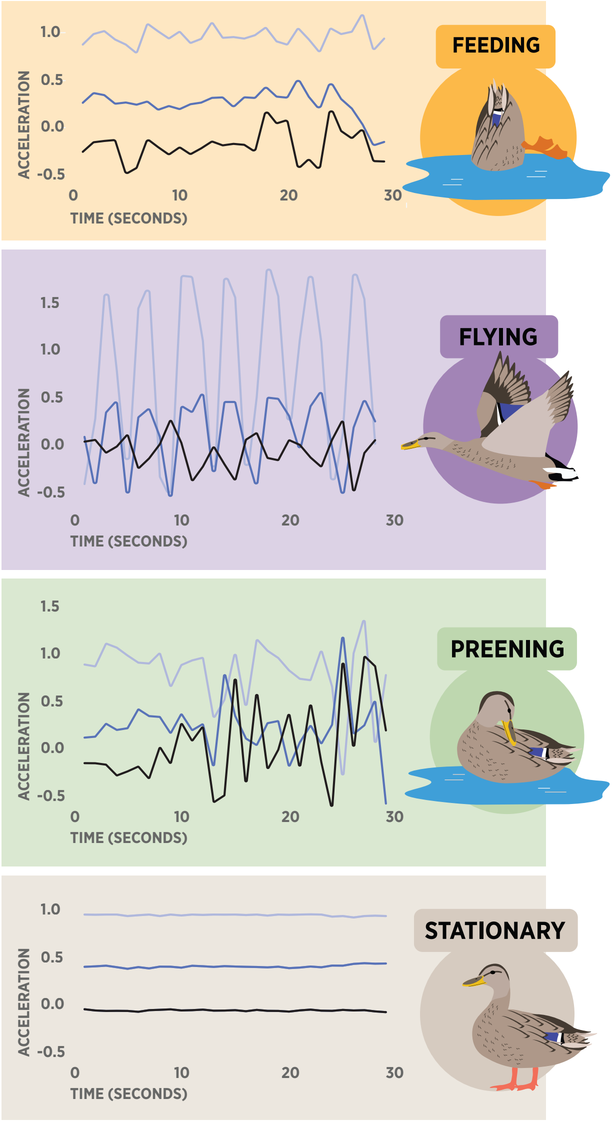
Sorting out where the problem lies is only becoming more urgent. Buoyed by expanded wetland protections, ducks had been a recent bright spot amid otherwise dismal avian population trends in the United States. But the latest "State of the Birds" report, published in March by a coalition of science and conservation groups, including Audubon, showed that duck populations have declined significantly in the past few years—a reversal likely due in large part to drought in the Prairie Pothole Region of the northern Great Plains, where millions of them breed.

As scientists and conservationists seek ways to help Mallards and other waterfowl rebound, the vast trove of data from the Atlantic Flyway project could prove invaluable, Colucсy says. "It's going to be mined for a very long time." Ⓐ

### EVERY MOVE SHE MAKES

How do scientists know what she's up to? Capturing her movements in three dimensions, the tracker reveals patterns that indicate specific behaviors.





DATA: CASSIDY WALDREP/ATLANTIC FLYWAY MIGRATION PROJECT

GRAPHICS BY JULIE ROSSMAN/AUDUBON

Dams on the central Platte River deploy water for irrigation and other uses.

# Diversion Dilemma

A plan to remove water from the Platte River basin worries Nebraska conservation advocates, who say there's none to spare.

BY JESSICA LEBER

ON THE CENTRAL PLATTE RIVER in Nebraska, every water drop has a purpose. Some generate electricity, irrigate farms, or meet demands downstream. Others ensure that Whooping Cranes have the habitat the Endangered Species Act requires. Often there aren't enough drops to fulfill all legal water rights in the heavily managed river valley.

But even overburdened rivers sometimes see seasonal floods or heavy rains, and water managers outside the Platte basin are seeking a share when that happens: They propose to divert water from the river during flush times and pipe some "excess" south to the Republican River basin, where the flow could help farmers irrigate crops and fulfill Nebraska's obligations under a water-sharing deal with Kansas. The Nebraska Department of Natural Resources is now weighing the plan.

> Large water pulses help maintain the wide, braided channels that birds use to roost or nest.

Conservationists acknowledge both rivers are overtaxed, but argue that taking water from one basin to supply another is a misguided idea that sets an alarming precedent in the state. At least 70 percent of the volume that once flowed through the region is already diverted before reaching Audubon's Rowe Sanctuary, which lies along an 80-mile stretch of river habitat where more than a million migrating Sandhill Cranes rest and refuel. "What we're trying to hold on to is the last 30 percent," says Melissa Mosier, Platte River program manager for Audubon Great Plains. "Any amount of water that comes out of that is a pretty big deal."

While periodic surges don't legally fall within a complicated system of Platte River water rights, experts say they play a key role in sustaining the hydrology and ecology that migratory birds have relied upon for millennia. "Those high flows are important because that's how the system historically functioned," says Abraham Kanz, conservation research director for the Crane Trust.

These influxes recharge wet meadows where cranes forage and refill underground aquifers that people rely upon. What's more, by shifting around sediment and scouring away tree seedlings, large water pulses also help maintain the wide, braided channels and sandbars that birds use to roost or nest.

In public comments last year, conservationists opposed to the idea were joined by local tourism offices and several natural resource and public power districts that rely on the Platte. Even the state of Kansas objected, fearing the spread of invasive carp. Project supporters in the Republican River basin, however, argue the diversion would make use of water that otherwise wouldn't benefit Nebraskans.

To Mosier, it's this narrow vision of water as a commodity that keeps the central Platte ecosystem—which attracts thousands of spring visitors and where Rowe Sanctuary recently marked its 50th anniversary—just "hanging on." After big floods, Kanz has seen how a streamflow surge can help struggling habitat. "These sites can recover, and we have proof you can bring them back," he says.

PHOTOS FROM LEFT: SYDNEY WALSH/AUDUBON; ASH PONDERS

# Ground Rules

As Arizona's wells run dry, a movement has surfaced to end an era of free-for-all water extraction.

BY LAUREN LEFFER

IN ARID SOUTHEAST ARIZONA, chile pepper farmer Ed Curry has monitored his wells and done his best to conserve water for five decades. But until recently, his diligence wasn't mandatory. When the state passed the 1980 Groundwater Management Act, it focused on cities, leaving aquifers in rural areas—about 80 percent of the state—unregulated. Anyone could drill a well and pump away.

About eight years ago, as larger farms and dairies began operating nearby, Curry started noticing that even wells he wasn't using were losing water. Without guardrails preventing overuse, the Willcox groundwater basin he draws from has, in recent years, lost the equivalent of 54,000 Olympic swimming pools of water annually. In 2023 Curry spent $600,000 drilling deeper wells. Every farmer he knows has had to do the same. "There's not one person that's not dealing with this," he says.

**Groundwater supports habitat in the San Pedro Riparian National Conservation Area, an important migratory bird stopover.**

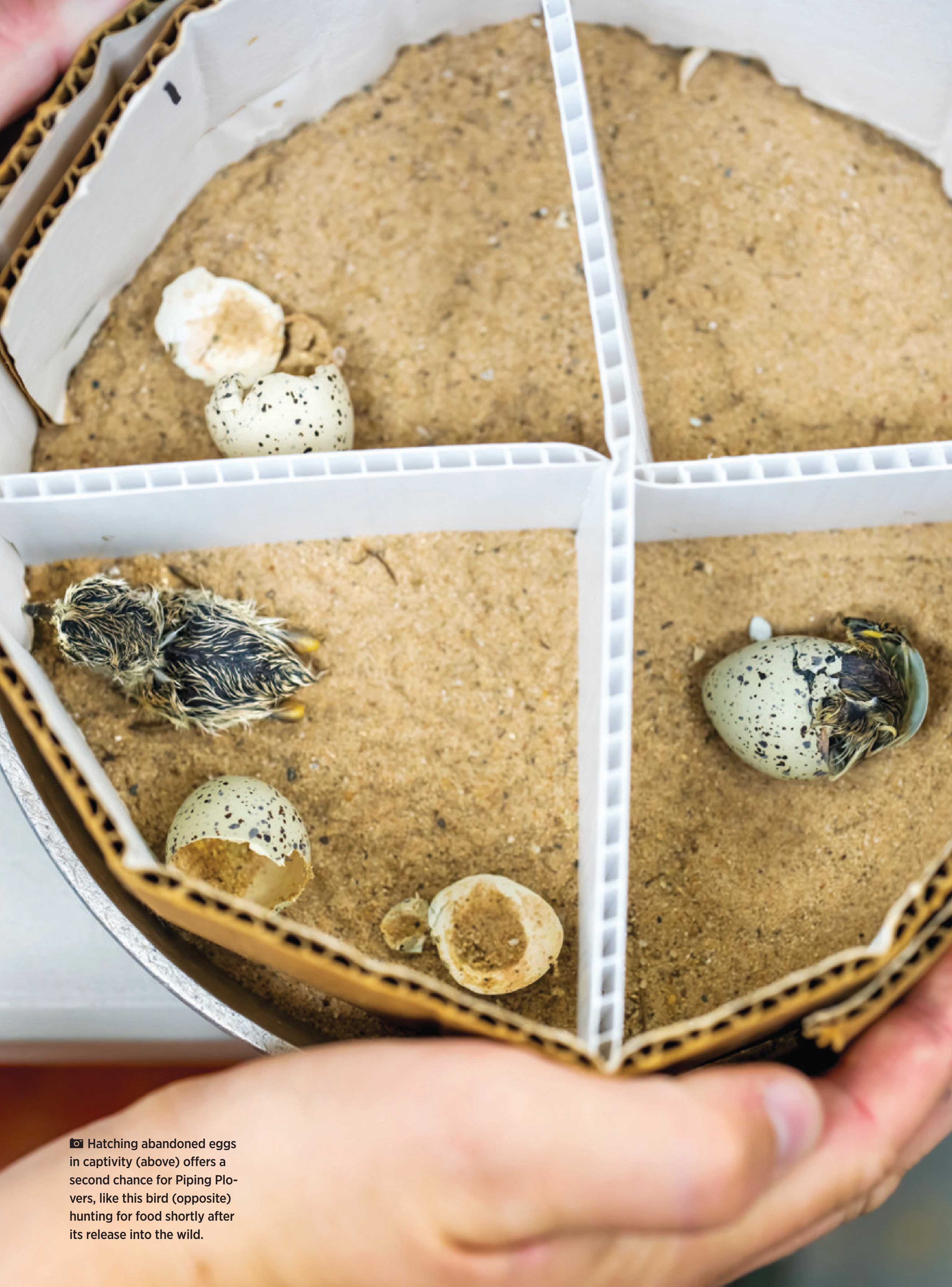
Statewide legislation is crucial not only for communities but also for birds.

Arizonans across the state are facing rapidly declining groundwater levels, and officials, lawmakers, residents, and conservationists say stemming the loss is urgent. That's why, in 2025, the Arizona Department of Water Resources took the unprecedented step of declaring the Willcox groundwater basin a new "active management area" (AMA) under the 1980 law. The designation requires large groundwater consumers in Curry's area to report their use, prohibits drilling large new wells, and aims to cut withdrawals over time.

Many now want to see that momentum spread statewide. Both Democrats and Republicans recently introduced bills to end Arizona's era of unlimited groundwater extraction. The proposals could slow declines and, importantly, offer locals more water management flexibility and input than current law allows. For example, existing rules in the Willcox AMA limit farmers' ability to trade water rights.

Statewide legislation is crucial not only for communities but also for birds, says Haley Paul, Arizona policy director for Audubon Southwest. Groundwater feeds the year-round flow of rivers like the San Pedro and sustains key stretches of riparian habitat that support a diversity of birdlife, including Yellow Warblers and Western Tanagers. When their roots can't reach the water table, native trees die—and invasive salt cedar moves in. "These ribbons of green, these groundwater-fed ecosystems, are really, really important in an arid environment," Paul says.

Without a sustainable water policy, Curry foresees a future where farming becomes increasingly difficult in his state. He now regularly drives for hours to testify about water issues before Phoenix lawmakers. But with the state's legislature and governorship split between parties, any hope of success rests on what can be difficult bipartisan compromise. Curry says tough choices are necessary. "It can't always be, 'It's my water, and to hell with everybody else,'" he says. "No, it's all our water, and we've got to figure it out."



📷 Hatching abandoned eggs in captivity (above) offers a second chance for Piping Plovers, like this bird (opposite) hunting for food shortly after its release into the wild.

# small but mighty

With dedication and ingenuity, a recovery team is helping an endangered population of Piping Plovers reach new heights.

**BY ANDY MCGLASHEN**
**PHOTOGRAPHY BY STEVE JESSMORE**

It's a balmy July afternoon on Cathead Bay, at the pinky tip of Michigan's mitten. But instead of swimsuits, the 11 people gathered on the beach are clad in biologist-casual: hiking pants, floppy hats, binoculars aplenty. They've formed a large arc bending toward the water. Between them and the vastness of Lake Michigan, three fuzzy chicks zigzag across the sand. An order crackles over walkie-talkies and the semicircle begins to tighten.

Twenty yards. The young Piping Plover siblings grow more frenzied. Ten. Their parents scurry nervously nearby. Five. Two people carefully drop custom-sewn cloth traps over one chick and then another. The last plover sees an opening and races to escape. Quick as anything, field crew leader Stephanie Schubel gently scoops it up by hand. She's been doing this for 17 years. It shows.

Contrary to what must be running through the shorebirds' 15-day-old brains, their captors mean them no harm. Quite the opposite: The scientists are here to gather vital information they hope will help save the fragile Great Lakes population of Piping Plovers. Kneeling in the sun-warmed sand, they weigh the chicks, attach bands to their tiny ankles, and swab their mouths to collect DNA samples. One bird plops a slick globule on Schubel's hand. "Oh, I got poop!" she says, genuinely pleased—more DNA, more data.

Within a few minutes the team will free the chicks to rejoin their parents, but they'll keep a close eye on this and every other Piping Plover family on the Great Lakes. From April, when the first plovers arrive, until July or August, when they depart for the southern beaches where they overwinter, professional and volunteer monitors will do all they can to keep the birds safe. Great Lakes Piping Plovers need this devoted caregiving because market hunting, waterfront development, and other forces nearly wiped them out in the 20th century. The birds were never very abundant here, probably totaling a peak of 500 to 800 pairs. By 1990, four years after the population was listed as endangered, the birds had become alarmingly scarce: Along the 4,500-mile Great Lakes coast, a mere 12 pairs had maintained a foothold. All of them were in Michigan.

Since then, a broad coalition of conservation partners—biologists and zookeepers, tribes and government agencies, nonprofits and universities—has brought about a striking rebound. "When you add it up, it's hundreds of people working really hard to try to save this one little bird," says Vince Cavalieri, a National Park Service biologist who oversees plovers at Michigan's Sleeping Bear Dunes National Lakeshore, the population's core stronghold, about 40 miles south of Cathead Bay. Last year the Piping Plover population reached a high of 81 pairs: 76 spread across five states, plus 5 in Ontario, on all five Great Lakes. Not only have the resilient shorebirds returned to remote coasts, they have also started families on human-built beaches and in the shadows of skyscrapers.

Even so, a tough road lies ahead. To delist the species, the U.S. population will need to nearly double, to a minimum of 150 breeding pairs, maintained for five consecutive years. Meanwhile, the plover partnership is caught in a frustrating game of Whac-a-Mole with an evolving cast of predators, and now uncertainty looms about whether federal funding critical to recovery efforts will continue. "The species is doing a heck of a lot better than it was even just a few years ago," says Tom Prestby, Wisconsin conservation manager for Audubon Great Lakes. "But there's still a long way to go."

**In the 1980s not everyone agreed there even *were* Great Lakes Piping Plovers.**

Many people have carried forward the work of saving Great Lakes Piping Plovers, but it all started with Francie Cuthbert. When she began researching the birds in the 1980s, not everyone agreed there even *were* Great Lakes Piping Plovers. Some scientists thought plovers nesting in the region were strays from two recognized populations—one along the Atlantic Coast and another on the Great Plains. Through the grapevine at the University of Minnesota, where she had recently joined the faculty, Cuthbert heard that a prominent shorebird biologist was telling colleagues she was wasting her time.

Cuthbert and her graduate students have long since proven the naysayers wrong. Since 1993 they have banded every plover they've found—more than 4,060 adults and chicks in total. Each individual gets an orange plastic band to signify that it came from the Great Lakes, along with a unique combination of bands of other colors to make the bird identifiable from a distance. No orange-labeled birds have been reported on the Great Plains, and monitors have spotted only four nesting along the Atlantic Coast. On the flip side,

📷 At Cathead Bay (top) a team bands chicks and gathers DNA samples (opposite). About 40 miles south, Vince Cavalieri (above) oversees the plover stronghold of Sleeping Bear Dunes.

there are just two records of Great Plains–banded plovers—and none from the Atlantic population—breeding in the Great Lakes. “As soon as we started banding, it was obvious,” she says. “It was very clear that it was a distinct population.”

The banding program has become “the most powerful thing that we’ve done to understand the Great Lakes population,” says Cuthbert, who retired from teaching in 2022 but still heads up research for the recovery effort. It’s also a hell of a lot of work. Schubel and her crew call themselves the Plover Truckers for their pinball travels between nesting sites each breeding season—intense bursts of banding followed by long hours on the road, along with short flights or boat rides to reach island birds. Despite the close quarters and grueling schedule, Audubon quantitative scientist Sarah Saunders, who previously led the effort and still joins the crew on occasion, says her days as a Plover Trucker were probably the best of her youth.

Banding has enabled Cuthbert and her colleagues to count plovers, track their year-to-year survival, keep tabs on where individuals nest and overwinter, and create detailed family trees. It has also helped them document astonishing feats. One bird flew from Sleeping Bear Dunes to the Miami area—something like 1,400 miles—in less than 48 hours. Another, known as Gabby for her green, blue, and yellow (GBY) leg bands, is, at 16, the longest-lived Piping Plover on the Great Lakes and a prodigious breeder, having hatched some 35 chicks. Saunders, who was Cuthbert’s graduate student a decade ago, says a great deal of plover research, including her own studies on how to improve reproductive success, would’ve been impossible without Cuthbert’s decision to start banding the birds. “She could see the long-term play,” Saunders says. (In 2021 Frontier Airlines honored Cuthbert by naming one of its planes “Francie the Piping Plover.”)

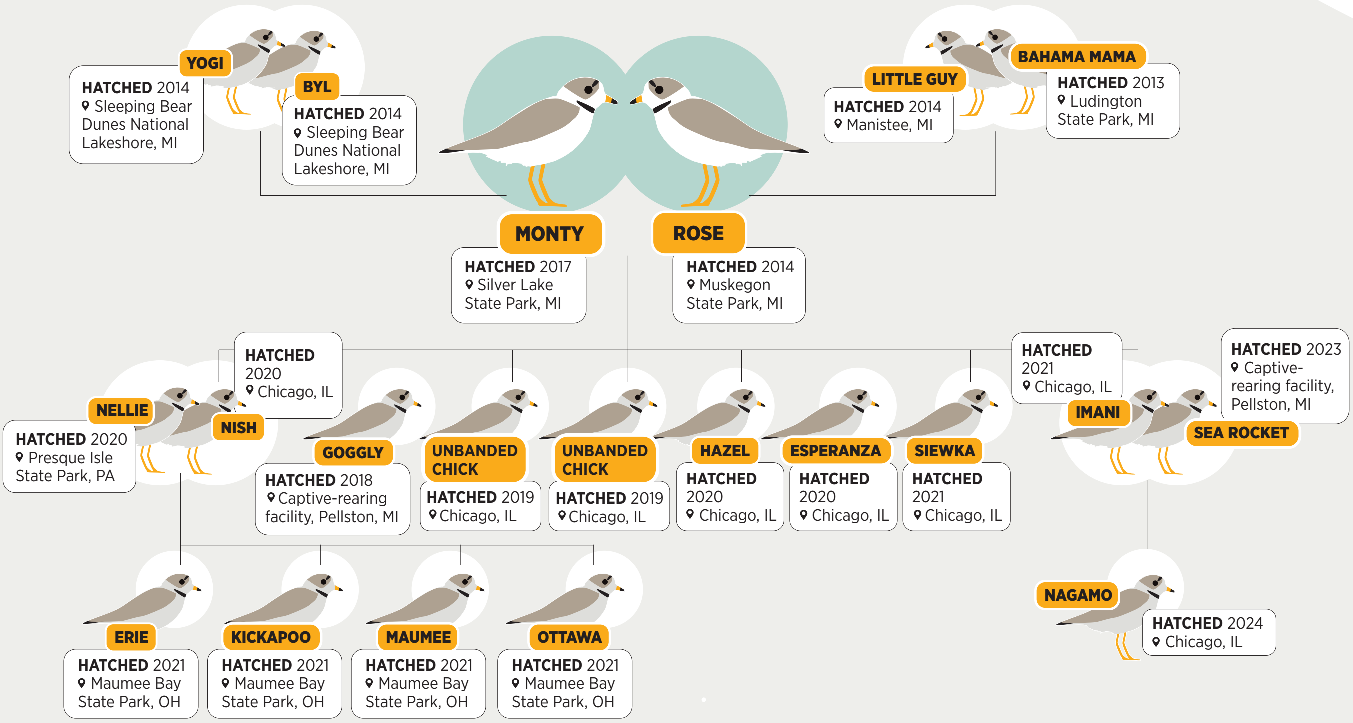
If Cuthbert’s banding brainchild proved key to understanding the Great Lakes population, another of her ideas has been essential for growing it. All too often a plover egg is orphaned when a predator picks off its parents or a jumbo wave washes it down the beach. Each loss is meaningful for such a tiny population, says Cavalieri: “You never know who’s going to be the next Gabby.” Based on previous research she had done on Killdeer, Cuthbert suspected that if the recovery team gathered up those abandoned eggs, they might be able to hatch them in captivity and return the birds to the wild. Once again, she was right. The captive-rearing program she launched in 1990 at the University of Michigan Biological Station in Pellston has fledged around 400 plovers that otherwise would have been lost.

Inside the captive-rearing facility, which is not much more than a shed, caretakers are constantly working to give rescued birds their best shot at survival. A trio of day-old plovers, which can already walk and feed themselves, share a repurposed tortoise enclosure with stuffed animals and a mirror. Seeing their reflection or snuggling up with a plush buddy helps the chicks feel more secure, says Bonnie Van Dam, curator of birds at the Detroit Zoological Society, who has overseen the captive-rearing effort since 2001. In lieu of a parent, chicks brood under feather dusters. Speakers play a hushed soundtrack of Great Lakes waves to attune the young birds to their future habitat. At night, their minders turn on lamps to mimic moonlight.

The caretakers come from zoos in the Great Lakes region and as far away as San Diego and Orlando, Florida. During shifts that can last up to two weeks, they’re with the birds from 6 a.m. to 10 p.m. Between six daily feedings, regular weigh-ins, frequent rotations of incubating eggs, and staying in touch with Van Dam for updates and troubleshooting, the work never stops. “Zookeepers

## windy city royalty

Monty and Rose became beloved avian celebrities when they nested in Chicago in 2019—the first Piping Plovers in seven decades to make the city home. Today their offspring continue to charm and inspire locals while playing a part in the population's rebound.


YOGI
HATCHED 2014
Sleeping Bear Dunes National Lakeshore, MI
BYL
HATCHED 2014
Sleeping Bear Dunes National Lakeshore, MI
MONTY
HATCHED 2017
Silver Lake State Park, MI
ROSE
HATCHED 2014
Muskegon State Park, MI
LITTLE GUY
HATCHED 2014
Manistee, MI
BAHAMA MAMA
HATCHED 2013
Ludington State Park, MI
NELLIE
HATCHED 2020
Presque Isle State Park, PA
NISH
HATCHED 2020
Chicago, IL
GOGGLY
HATCHED 2018
Captive-rearing facility, Pellston, MI
UNBANDED CHICK
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Chicago, IL
UNBANDED CHICK
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Chicago, IL
HAZEL
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Chicago, IL
ESPERANZA
HATCHED 2020
Chicago, IL
SIEWKA
HATCHED 2021
Chicago, IL
IMANI
HATCHED 2021
Chicago, IL
SEA ROCKET
HATCHED 2023
Captive-rearing facility, Pellston, MI
ERIE
HATCHED 2021
Maumee Bay State Park, OH
KICKAPOO
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Maumee Bay State Park, OH
MAUMEE
HATCHED 2021
Maumee Bay State Park, OH
OTTAWA
HATCHED 2021
Maumee Bay State Park, OH
NAGAMO
HATCHED 2024
Chicago, IL

are very passionate about their jobs," she says. "They're very good at multitasking and making do."

As if to prove themselves worthy of such devoted care, young plovers evince a mighty will to live. The keepers use Elmer's glue to carefully patch eggs that arrive cracked or dented, and for the most part the chicks turn out just fine. Vickie Igleski, who hails from Chicago's Lincoln Park Zoo, points to a healthy pair of nearly two-week-old chicks that were found as eggs tumbling in the surf. "You guys are miracle babies," she tells them.

Through some combination of their own tenacity and the zookeepers' resourcefulness, more than 90 percent of the eggs that arrive at the facility survive to fledge, compared to a coin toss among wild plovers. The youngsters test their wings in an outdoor pen on the shore of a small lake at the biological station. Then, when they're about a month old, they're released into the wild on Great Lakes beaches. That's when the real peril begins.

A FEW HOURS BEFORE THE BANDING CREW arrives at Cathead Bay, Cavalieri trudges up a dune at Sleeping Bear Dunes, trailed by Schubel, Igleski, and a few others and carrying three plovers in a plastic crate. They've come to release these captive-reared birds into their ideal habitat. After descending to the beach along Lake Michigan, Cavalieri and Schubel kneel beside the crate and gently lift its top. Out flutter the fledglings. They make short, exuberant flights, their first in the wild, and scatter across the lakeshore. One plover wheels high over the dunes and then settles in the zone where sand merges with surf-smoothed cobbles. Its plumage perfectly matches the backdrop, and for a moment the bird has vanished. Then it scuttles across the beach and takes wing.

With dunes jutting hundreds of feet above the aquamarine lake and the Manitou Islands beckoning a few miles offshore, it's a breathtaking

**More than 90 percent of eggs that arrive at the captive-rearing facility survive to fledge.**

landscape. Because it is part of the national park system and mostly undeveloped, it's also among the safest places to release the birds. Even in this plover paradise, however, danger lurks everywhere. A few years ago on North Manitou Island, a sandy wilderness that supports nearly a quarter of all Great Lakes Piping Plovers, a single family of coyotes wiped out some 20 chicks. It was a devastating loss for the vulnerable population.

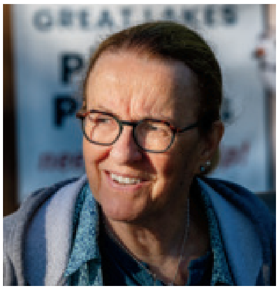
For the past several years, death has more often come from above. When Cuthbert began her plover work, Merlins were a rare sight; like other falcons, they had been hit hard by the insecticide DDT. In the 1990s, though, Merlin populations experienced a significant rebound. "Now they literally are at every plover nesting site in the Great Lakes," she says. "They are a magnificent killing beast."

Today the recovery team works with Wildlife Services, a division of the U.S. Department of Agriculture, to kill the raptors at some nesting areas, and it is investigating nonlethal methods for managing them. Nobody wants to destroy one bird to save another—Cavalieri credits a Merlin encounter with setting him on a bird-focused career path—but it is necessary. In 2018 Saunders led a study showing that without some lethal management, Merlins alone could upend the plover rebound.

Now there's a new menace. In 2024 Saunders, Prestby, and federal scientists published a paper providing the first evidence of Common Grackles feasting on Piping Plover eggs. Many nests are surrounded by cages meant to deter predators, but these exclosures were designed for larger animals, like foxes, gulls, crows, and raccoons. Grackles waltz right through them. "I don't know how we deal with that," Cuthbert says. Doing so may require removing trees near nests to prevent grackles from gathering, the paper's authors suggest, modifying the cages, or even abandoning the protective structures altogether—despite the obvious risks—so they don't serve as billboards for an easy meal.

Fortunately, the plovers don't face these threats alone. Around the Great Lakes, volunteer and professional monitors are the heart of the recovery program. They identify nest sites, erect protective fencing, rescue abandoned eggs, and educate members of the public—their spotting scopes tend to draw curious beachgoers—about the importance of keeping dogs on-leash and giving the birds space to raise their young. "Every year I'm blown away by how much affection and love they have for these birds," says Tamima Itani, the lead volunteer coordinator in Chicago. "The monitors do everything they can to protect the plovers and their nests."

Great Lakes plovers are most vulnerable while nesting, but the danger doesn't stop when they fly south. On their wintering grounds, which stretch from Texas to the Carolinas and the Caribbean, the Great Lakes birds mix with Piping Plovers from the Atlantic and Plains populations and concentrate in coastal inlets that provide ideal foraging and roosting areas. Because such areas are also popular with tourists and dog walkers, bird advocates have ramped up educational programs on these beaches, too. "We use them for recreation, and they use them for survival," says Lindsay Addison, a coastal biologist at Audubon North Carolina. Inlets also are often mined for sand, which is hauled away to renourish naturally shifting shorelines, she says. To help protect these sites, Addison and her colleagues survey inlets to gather data on



📷 At the captive rearing facility that Francie Cuthbert (above) established in 1990, zookeepers incubate rescued plover eggs (opposite) and help chicks acclimate in an outdoor pen (top).

GRAPHIC: JULIE ROSSMAN/AUDUBON. DATA: GREAT LAKES PIPING PLOVER CONSERVATION TEAM

how plovers use them, information that shapes permitting decisions by the U.S. Army Corps of Engineers and other regulators.

Accelerating climate change poses other threats to beaches at both ends of the plovers' range. In the South, rising seas are eroding roosting sites, which in turn fuels demand for sand mining elsewhere. "King tides were never really something I dealt with earlier in my career," says Melissa Chaplin, the South Carolina–based recovery team lead for the U.S. Fish and Wildlife Service (FWS) field office. And while the Great Lakes are nontidal, shifting precipitation patterns and declining ice cover have produced increasingly dramatic swings in annual lake levels. In some years high water submerges the wide beaches plovers need, leaving them with only marginal areas for nesting.

There's encouraging evidence, though, that restoring habitat can help Piping Plovers thrive even in places that were once degraded. As soon as state and federal partners removed invasive plants and rehabbed a beach in Michigan's Wilderness State Park in 2016, a pair of plovers nested at a site that had been abandoned for nearly a decade. In Wisconsin, plovers almost immediately took to new habitat after the Army Corps rebuilt islands in Lower Green Bay. They returned the next breeding season and nested there for the first time in 75 years. It was a major milestone for the state and the recovery effort, says Audubon's Prestby, who coordinates plover monitoring at the site with the FWS and discovered the landmark nest.

**At 16, Gabby is the longest-lived Piping Plover on the Great Lakes and a prodigious breeder.**

Restoring coastal habitat is expensive work, and on the Great Lakes—churning with waves that can top 20 feet and edged with ice shelves that pummel the shoreline in winter—one major storm can quickly erase progress. But when it works, restoration benefits many more birds than just Piping Plovers, Prestby says. "They get all the news headlines and the grant money to help them out, but actions that help them are going to help a lot of other species."

NOW, FOUR DECADES INTO RECOVERY efforts, Great Lakes Piping Plovers are halfway to the goal of 150 U.S. pairs. The road map for getting there is relatively straightforward, Cavalieri says: "The best conservation strategy is still protecting the places we've got as best we can, and trying to get as many chicks fledged as we can, and just build the numbers up to a point where they can absorb predation a little bit better."

The people working toward that target have proven they've got the gumption and grit to reach it. What's less certain is whether they'll have the resources. The Trump administration's crackdown on government spending and mass firings of federal workers, for instance, have caused delays in purchasing materials and hiring seasonal employees at Sleeping Bear Dunes, which left the plover team understaffed as the birds began returning this spring.

On top of that, conservationists are anxious about the future of a vital funding source for plover conservation across the region: the Great Lakes Restoration Initiative (GLRI), a bipartisan program that has spent some $5 billion to clean up and protect the world's largest freshwater ecosystem. Since 2010 the initiative has paid for banding, monitoring, captive rearing, research, and habitat restoration. The recovery team cannot sustain their work without the GLRI, Cuthbert says.

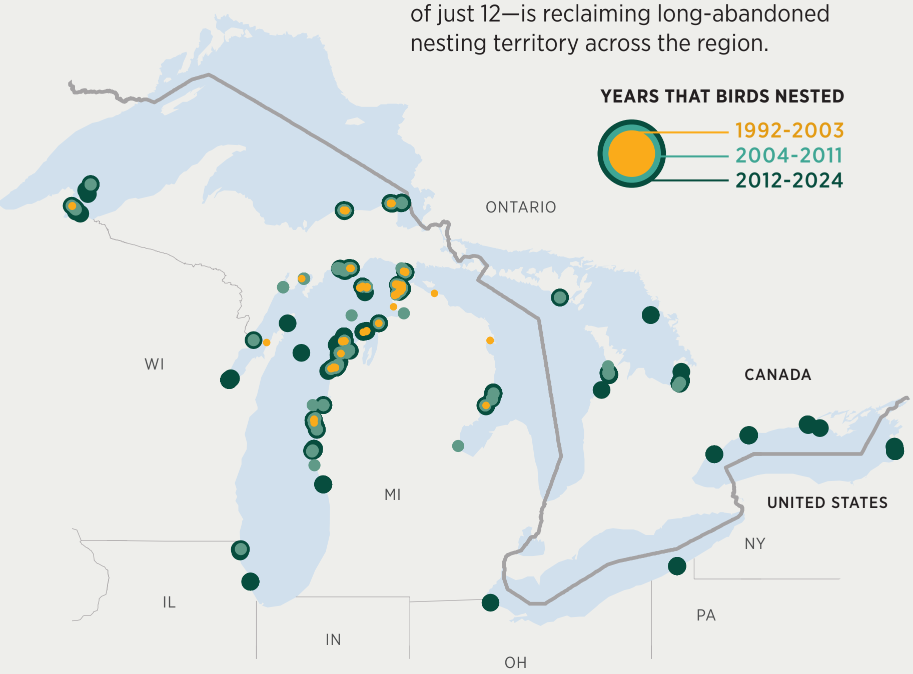
The Department of Government Efficiency, a unit launched under Elon Musk's direction, has announced staff cuts at the EPA, raising questions about the agency's ability to effectively administer the GLRI. What's more, during President Trump's first term, he proposed three consecutive budgets that called for slashing Great Lakes funding, though the cuts failed to make it through Congress. The president's more recent and aggressive efforts to gut government programs have heightened concerns that this time he could succeed.

Plover conservation represents only a tiny slice of the initiative, which has supported some 8,000 projects to clean up pollution and manage invasive species, among much else, yielding $3 in economic benefits for every dollar invested. Though uncertainty and unease are the vibes du jour, Cuthbert and others remain hopeful that Congress will continue to invest in the GLRI. The region's voters feel a profound connection to the lakes, and their elected officials know it. A bipartisan bill introduced earlier this year would reauthorize and increase the initiative's funding, which expires in 2026, for five years.

For her part, Cuthbert certainly has no intention of letting up. Arriving at the biological station one day last summer to check on the chicks in captivity, she moves slowly but with purpose,

## many happy returns

As the Great Lakes Piping Plover recovery effort nears the 40-year mark, the growing population—a record 81 pairs, up from a low of just 12—is reclaiming long-abandoned nesting territory across the region.



GRAPHIC: JULILE ROSSMAN/AUDUBON. DATA: GREAT LAKES PIPING PLOVER CONSERVATION TEAM

📷 Seen here foraging at her winter home on Georgia's Cumberland Island, Gabby is the grande dame of the Great Lakes population. The 16-year-old has hatched 35 chicks, and had just laid another clutch of eggs as *Audubon* went to press.

despite having just had surgery on both hips. She plans to do what it takes to keep showing up each season right on time, along with the plovers. "I'm interested in staying on as long as I can," Cuthbert says. "Every morning I wake up and I'm excited to check my texts."

There's been plenty of cause for excitement, and one of the most encouraging signs yet has come in the past two years. Historically the team has released captive birds only in Michigan at established strongholds like Sleeping Bear Dunes. But in 2023 the recovery team decided for the first time to set birds free in other Great Lakes states. For one thing, having so many plovers clustered together makes the population vulnerable; one storm or disease outbreak could spell disaster. Plus, data show that captive birds are especially likely to return to their release site. Faced with a bumper crop of 39 captive chicks and a delisting goal of establishing 50 nesting pairs outside of Michigan, they chose to roll the dice.

The gamble paid off. Twelve of the 18 birds turned loose in Wisconsin, Illinois, and New York returned the following spring, and six of those nested where they'd been released. One of the sites was on Montrose Beach, a bustling patch of public lakefront in Chicago that had become a showcase for the bird's rebound. In 2019 Itani, the site's volunteer coordinator, found a pair of Piping Plovers beginning to nest in the city for the first time in seven decades. In a nod to the birds' new home, she named them Monty and Rose. Itani and her fellow monitors worked with the public to give the birds space, and the duo became media darlings, lovable symbols of recovery and resilience.

Rose didn't return in 2022, and Monty died that spring from a fungal infection. That's the way it goes with the Great Lakes Piping Plover rebound: Like climbing the sand dunes at Sleeping Bear, it's often two steps forward, one step back. In 2024, though, one of their offspring, a male called Imani, wooed a female named Sea Rocket—one of the three captive-reared birds released in Chicago the year before. The pair hatched four chicks on Montrose Beach. Within days three of them had died of unknown causes, but one young bird, known as Nagamo, survived.

As *Audubon* went to press, Nagamo's whereabouts were unknown, but other birds were returning to nest. A plover arrived in Ontario on April 4, the earliest spring return on record. Among the birds observed by monitors at Sleeping Bear Dunes was Gabby, grande dame of the Great Lakes plovers, who promptly laid her latest clutch of eggs. In the Windy City, three males had touched down, including Imani, the last descendant of Monty and Rose. Then, on Mother's Day weekend, Sea Rocket appeared and soon mated with Imani once more. Her return to Chicago was a powerful shot of hope in a two-ounce package, a testament to the sort of toughness Midwesterners prize. "If they can raise plovers at Montrose Beach," Cuthbert says, "they can survive anywhere." Ⓐ

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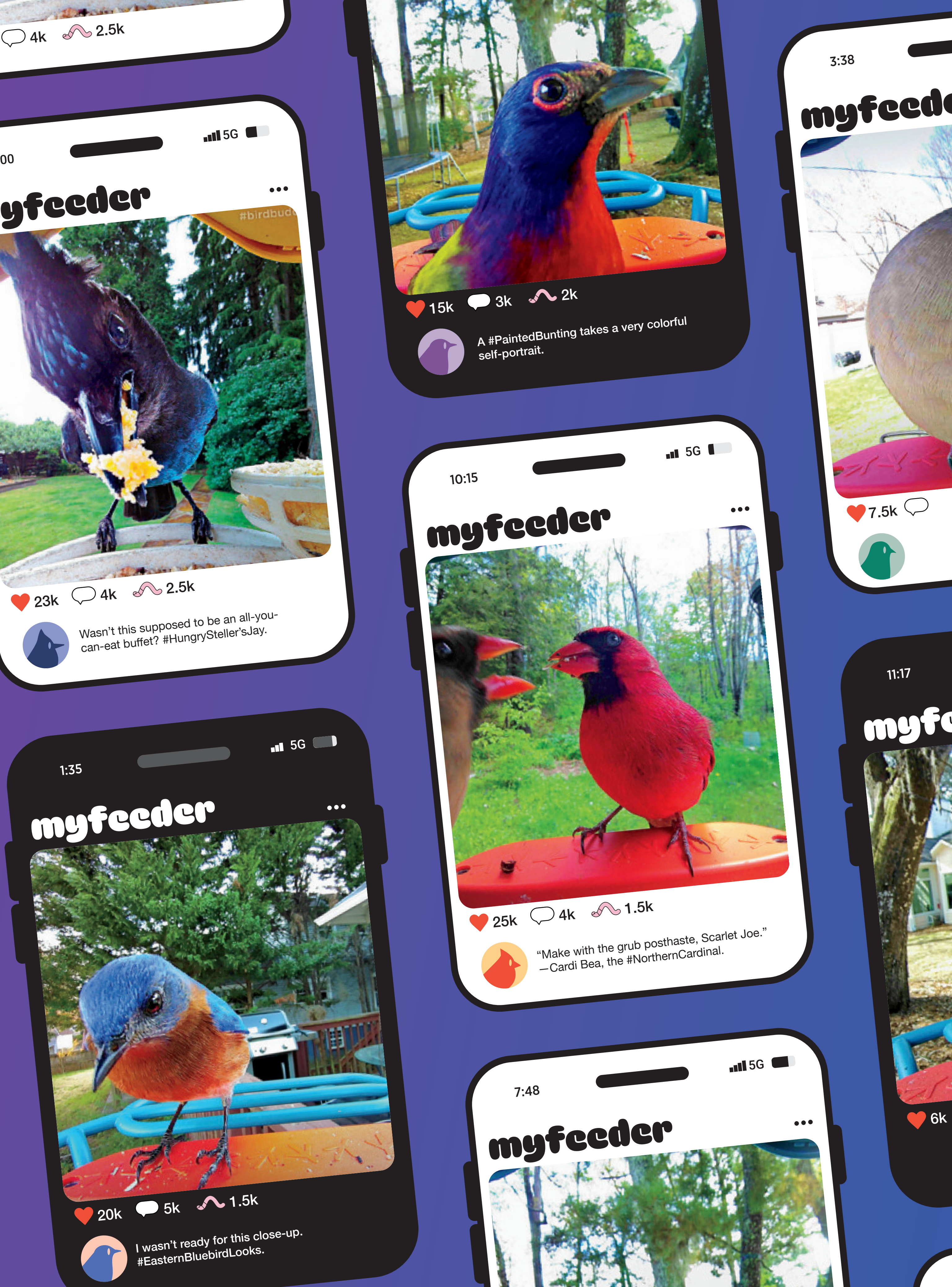
Audubon *senior editor and Michigan native* **ANDY MCGLASHEN** *can be a bit much if you get him talking about the Great Lakes. Michigan-based photographer* **STEVE JESSMORE** *is dedicated to protecting the state's Torch River, giving voice to birds, and raising awareness about habitat loss.*



4k 2.5k

00

5G

yfeeder

#birdbud

23k 4k 2.5k

Wasn't this supposed to be an all-you-can-eat buffet? #HungrySteller'sJay.

15k 3k 2k

A #PaintedBunting takes a very colorful self-portrait.

10:15

5G

myfeeder

25k 4k 1.5k

"Make with the grub posthaste, Scarlet Joe."
—Cardi Bea, the #NorthernCardinal.

1:35

5G

myfeeder

20k 5k 1.5k

I wasn't ready for this close-up. #EasternBluebirdLooks.

7:48

5G

myfeeder

3:38

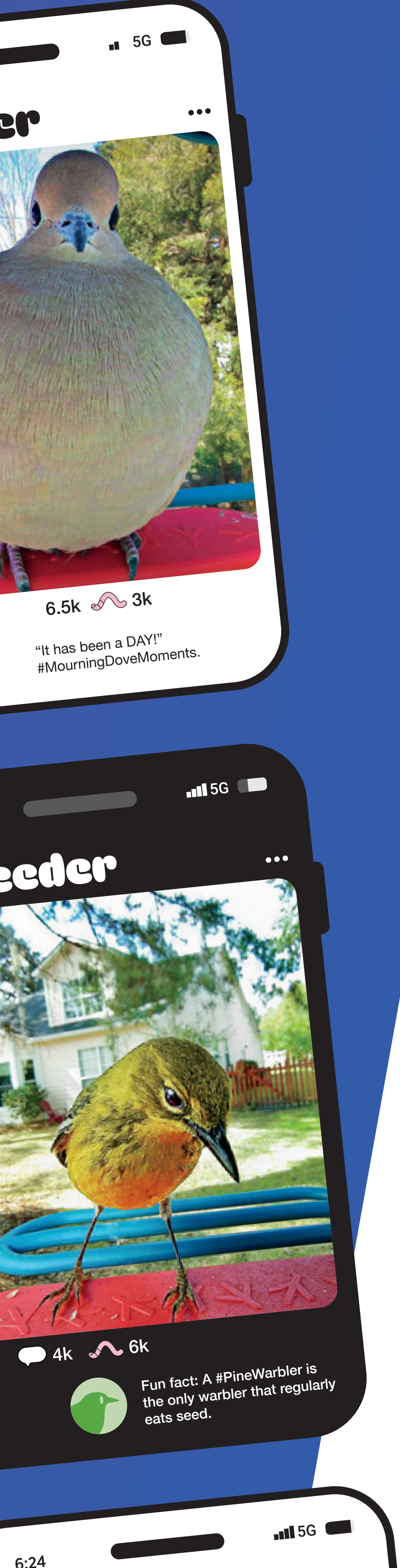
myfeede

7.5k

11:17

myf

6k



"It has been a DAY!" #MourningDoveMoments.

Fun fact: A #PineWarbler is the only warbler that regularly eats seed.

SOCIAL ANIMALS

# COMING TO YOU LIVE!

Popular bird feeders with connected cameras offer a new lens into the avian diversity near our homes. They're also linking us to each other.

**BY ELENA PASSARELLO**
**ILLUSTRATIONS BY EMILY RENAUD**

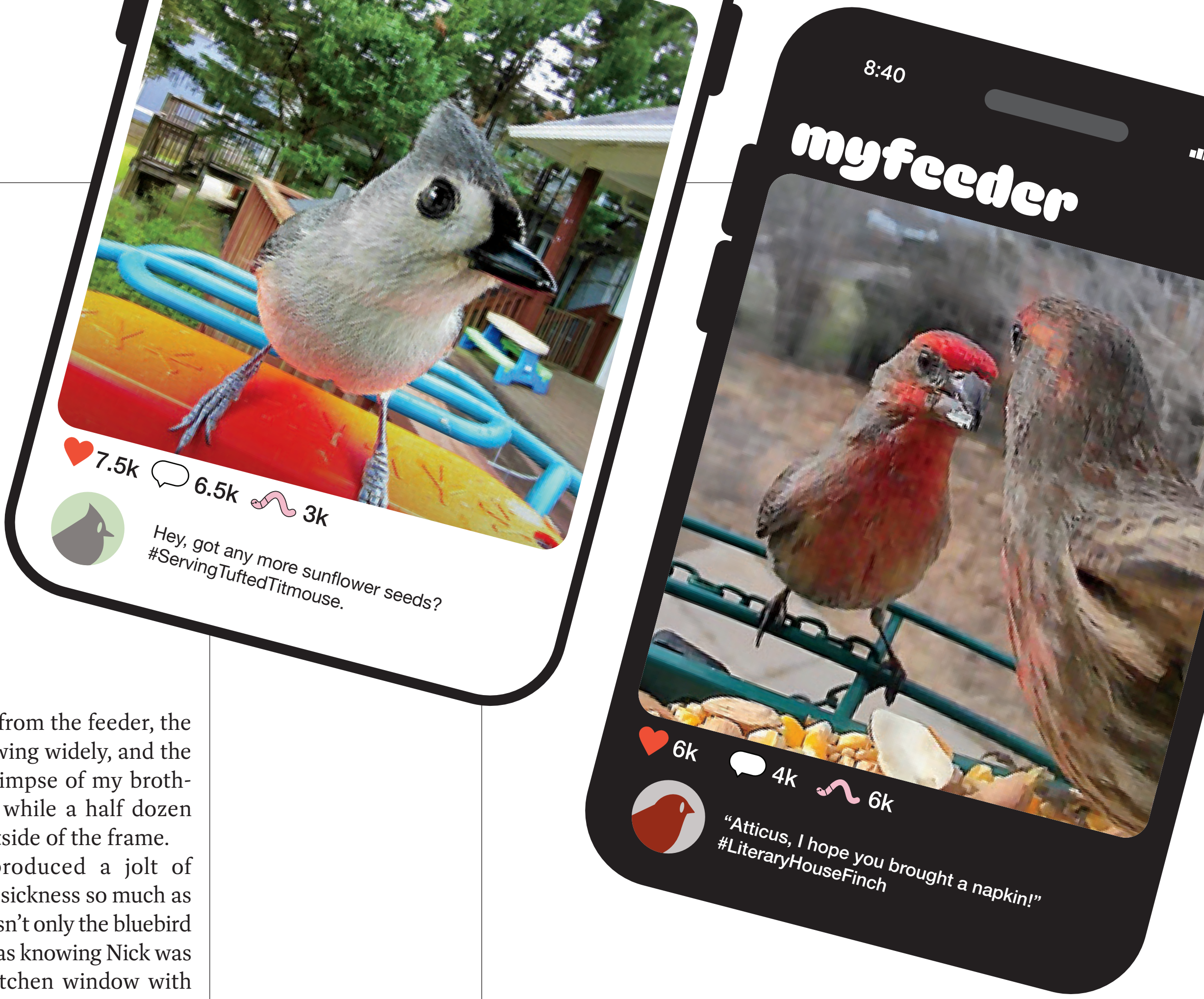
THOUGH I MOVED AWAY FROM MY HOME STATE 30 YEARS ago, I still miss the noise of a Georgia backyard. We've got plenty of bird sounds to enjoy here in Oregon, but come spring, I find myself dialing up my Atlanta kin and hoping they answer from the porch or while walking the neighborhood. Those chords of southern birdsong—the *freepereee* of Eastern Towhees and the *peterpeter* of Tufted Titmice—ring a bell in my heart, even when the sound is compressed and sent through a cell phone.

Now my phone gets me even closer to the birds of my youth. Earlier this year, *Audubon* asked me to explore the recent rise of "smart" bird feeders and learn what roles these devices play in bird lovers' lives. Equipped with built-in cameras and wifi connections, these souped-up feeders record avian visitors snacking on seeds or nectar and then send the image files to slick mobile apps. I was initially wary of downloading one more distracting app—I'd been trying to "consciously uncouple" with my phone for months—but the chance to get some southern birdsong in my pocket while connecting with my long-distance family won out.

I messaged my brother Nick, who shares a nice Georgia backyard with his wife, Emily, and my three ultra-cute niblings. Would he have the time and bandwidth to set up a high-tech feeding station? "I'm super pumped," Nick texted back. "Gonna watch some birbs when I'm supposed to be working."

I sent him the latest generation of the Bird Buddy feeder, which he installed on a hook that faces his kitchen window. We both downloaded the company's app so I could link with his feeder's, uh, feed. Within minutes of setup, my phone trilled: "A new species just showed up at the feeder!" Seconds later, a text from Nick: "Did you get the notification about the bluebird?" I opened the app, and there he was: an Eastern Bluebird, riffling through seed mix with aplomb, captured in a triptych of two snapshots and a movie short.

To misquote Gloria Swanson, I wasn't ready for this close-up. Never have I had the opportunity to count the feathers on a bluebird's azure cap or marvel at the inward turn of its toes. In the video, the bluebird hops into the structure, standing close to the HDR camera. I could see the bird's surprisingly muscular back tense and slacken.



Hey, got any more sunflower seeds? #ServingTuftedTitmouse.

"Atticus, I hope you brought a napkin!" #LiteraryHouseFinch

When he launched from the feeder, the force caused it to swing widely, and the camera caught a glimpse of my brother's backyard grill, while a half dozen other birds sang outside of the frame.

The moment produced a jolt of emotion—not homesickness so much as a home exhale. It wasn't only the bluebird that thrilled me; it was knowing Nick was just beyond that kitchen window with his family, too. That's when I recognized why these cool gadgets have become so popular. They're not just connecting us to our birds—they're also connecting us to our people.

**THE MOMENT PRODUCED A JOLT OF EMOTION.**

SINCE THE ADVENT OF STILL and motion cameras in the 19th century, people have used imaging technology to observe wildlife. But the rise of web cameras in the mid-1990s presented a supercharged opportunity to observe the planet's other animals, anywhere and anytime. In 1998 Africam's "online watering hole" began offering a view of Kruger National Park, including dramatic images of lion attacks and hyena fights that were seen in real time on every continent. "Why go to the zoo or aquarium if the zoo can come to you?" wondered *The New York Times* two years later. By then, anyone could sit in their cubicle and watch an elephant birth at the Indianapolis Zoo or daily panda feedings in San Diego.

This was around the time my alma mater, the University of Pittsburgh, trained a camera on a Peregrine Falcon nest on the tallest building on campus. I'd recently moved away, and it was fun and novel to virtually check in from the vantage of a bird perched a few stories above my old French classroom. The falcon cam's footage was poor by today's standards: grainy, *Cops*-caliber shots of a gray blot (Dorothy the Peregrine) and three smaller blots (her hatchlings). Like other nature cams of the era, the feed updated only twice per minute, so tuning in felt like watching a laggy stop-motion film.

Then, as it does, technology leapt forward. Image quality improved. Advancements in solar batteries and satellite reception allowed for more remote camera placements. At home, faster internet made streaming easier. The better tech and distribution networks brought the drama front and center: live-action territory fights, courtship dances, parenting dramas, and graphic acts of predation. This intensity soon bred a cast of wildlife cam celebrities.

For more than a decade, viewers have tuned in to keep tabs on beloved couples like Rachel and Steve, a pair of Ospreys that nested at the Hog Island Audubon Camp in Maine. They've monitored wildlife hotspots including Alaska's Katmai National Park, where brown bears fish at Brooks Falls each summer. Reporters now regularly cover the trials of Jackie and Shadow, two Bald Eagles in California who went viral in 2023 while tending their nest through a harrowing winter. Tens of thousands of online fans submitted suggestions to name the pair's latest eaglets, ultimately dubbed Sunny and Gizmo.

Followers aren't simply watching these #famous creatures; they're discussing them and contributing to science. Within months of the brown bear cam launch at Katmai, thousands had logged on to the livestream and made friends with one another. "We were amazed how quickly a community developed," says Mike Fitz, now a resident naturalist for the nonprofit Explore.org, which hosts a network of livestream nature cams. And with viewers clocking in at all hours to form 24/7

(OPENING SPREAD) PHOTOS CLOCKWISE FROM TOP LEFT: COURTESY OF MICHELLE CAMPOLI; MIKE PASSARELLO; MICHELLE CAMPOLI; MIKE PASSARELLO; MICHAEL METIVIER; NICK PASSARELLO. (THIS PAGE) PHOTOS FROM LEFT: COURTESY OF NICK PASSARELLO; MATTHEW PERKINS

stakeouts, cam devotees are often the first to spot noteworthy animal behavior—and, once, a lost hiker. Experts also engage with these cam communities, answering questions and harvesting wildlife data from a trove of crowdsourced photos, which are captured live and saved by users. A fan post about Katmai's zaftig bears even helped spur the now-popular Fat Bear Week tournament. (Shout-out to 2024's chonky champ, Grazer. I was pulling for you, bud!)

The biggest boom in wildlife watching came during the COVID-19 pandemic. As I learned to work from home, I flipped through nature cams like they were cable channels, toggling from a South African penguin colony to Audubon's Crane Cam in Nebraska to toucans at a fruit feeder in Panama. And when I wasn't web surfing, I was tuned in to the avian inhabitants outside my window. Many people self-soothed in similar ways: Engagement on Explore.org doubled in the first six months of 2020, and interest in traditional backyard bird feeding also soared. By 2022 a whopping 91 million U.S. residents were watching birds close to home, according to a U.S. Fish and Wildlife Service survey.

As the pandemic waned, the smart feeder made its well-timed entrance. New bird enthusiasts could buy a gadget that married some of the delights of traditional animal livestreams—the ability to unobtrusively observe nature through a memetic, shareable technology—with the personal appeal of turning the lens on the birds outside our homes. It didn't take long for feeder owners to become a little obsessed.

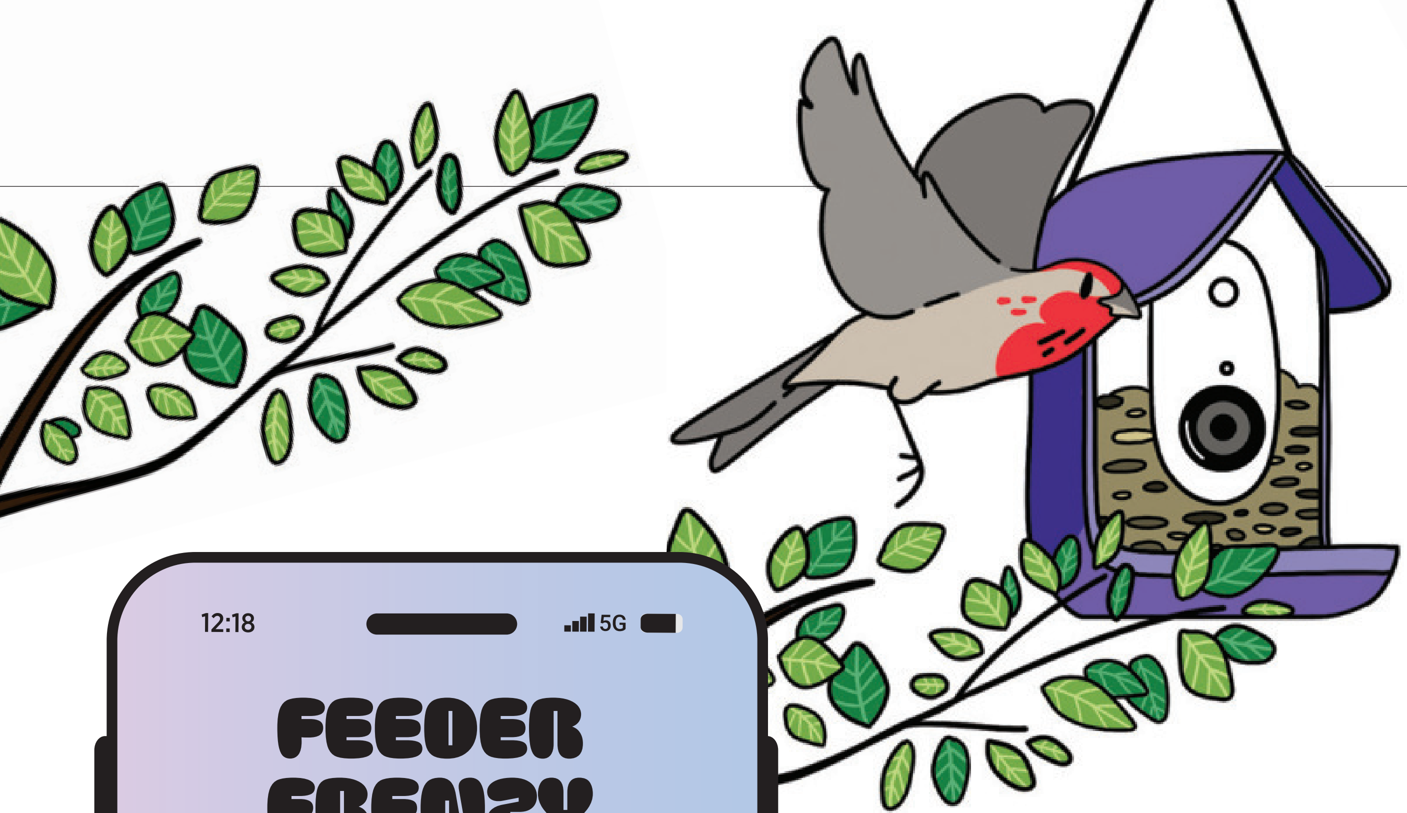
FOR MOST OF HIS LIFE, MATT Perkins didn't have birds on his radar. That changed last year, when the Colorado-based handyman and DJ played a few rounds of Wingspan at a friend's place. The board game opened his eyes to the avifauna around him. Inspired to explore birds in real life, he googled "bird feeders," and a model with a camera popped up.

Though he'd never had a birdwatching device before, Perkins quickly became a devotee of his Osoeri feeder cam. The app's notifications, he says, are "sometimes the best part of my day." While he's on a job, they supply hits of ornithological dopamine. If his phone dings while he's at home, it's permission to take a cup of coffee to the window and watch. Within a month, he'd given devices to three friends. "Once I figured out we could view each other's birds, I got so excited," he says.

With their easy use and photogenic payoffs, the feeders appeal to both newbies and seasoned birders. "It's kind of like the Fabergé shampoo commercial," says Oregon backyard birdwatcher Michelle Campoli. "You tell two friends, and they tell two friends." In the evenings, she reviews her day's photo cache for giggle-worthy snaps—the fish-eye angle of the lens is "just a smile generator," she says. She sends me two memeable shots as proof: a European Starling opening its beak wide enough for a full oral exam, and a Mourning Dove captured at such close range that it looks like a feathered snowman.

Campoli's feeder, like a number of models, uses AI technology to identify bird visitors. This feature, combined with a quality camera, can flatten a novice birder's learning curve, with labeled images popping up on an app like quiz flash cards. All AI systems make errors, though, and while some are obvious—one "Common Grackle" photo on my app's public feed was really a seed-stealing white-tailed deer—most are more subtle. Campoli sees the misidentifications as a learning opportunity. If an ID seems suspicious, she checks other reference texts or consults friends at her local seed supply store, and "this elevates my bird skills." By correcting the app, she notes, she's helping AI models improve, too.

Environmental writer Ben Goldfarb—one of the recipients of Perkins's feeder giveaway—enjoys how his smart feeder helps him spot rare gems in his yard



in Salida, Colorado. He and his wife track all of their sightings, caught via camera or naked eye, on a whiteboard in their laundry room (the list was 52 species strong at press time). “I’ve never seen a Mountain Chickadee back there with my own eyes, but one shows up on the camera occasionally, so the camera reveals diversity that we otherwise wouldn’t notice,” he says. Goldfarb also appreciates the camera’s ability to capture fine details of animals and their interactions. “You see these personalities observed through their behavior.”

Though they’re an investment, smart feeders can help make backyard birding even more accessible. Those with no outdoor space can tune in to a friend’s feed. Kids who struggle to hold binoculars, like my nieces and nephew, might find it easier to scroll through a camera roll. Seventy-nine-year-old Marcia Fisher says smart feeders are great for older birdwatchers, too. There was a time when she followed naturalists along Galveston’s waterfront, climbing hills and jumping over ditches. Now that her scrambling days are behind her, she’s “happy to stick with whatever comes to the backyard” and lands on her feeder cam in Texas.

Fisher mentions her most treasured image: a male Northern Cardinal popping a sunflower seed into the beak of its mate. “Oh, it’s the neatest photo,” she tells me. “I’ll send it to you.”

INFECTIOUS SHARING IS CRUCIAL TO SMART FEEDER CULTURE. My new friends and acquaintances have been sending me photos, which I forward to others as we dish on hot-button yard topics like squirrel annoyances. But the most palpable benefit, for me, has been connecting with family. Over the past months, Nick and I have continued our cross-country bird chat, and we also exchange snaps with our cousin Michael, who uses his feeder to spot Painted Buntings and Pine Warblers in South Carolina. (“It’s like Pokémon for adults,” he jokes.)

My friend Aimee Nezhukumatathil, a writer in Mississippi, recently halted a dentist visit when she got a notification of a Ruby-throated Hummingbird at her yard’s Harymor feeder. “Look at what’s going on at my house right now!” she exclaimed (hopefully not with a mouth full of gauze). Perkins and Goldfarb have been swapping footage for more than a year, geeking out over

12:18 5G

## FEEDER FRENZY

**Ensure you—and the birds you love—get the most out of your new gadget.**

**PUT BIRD WELFARE FIRST.** Look for a sturdy product with drainage holes that will prevent seed spoilage and mold. Mount it in a place where it’s easy to regularly clean and refill. For more basic bird-feeding tips, visit **audubon.org/birding/backyard.**

**CHOOSE WISELY.** Feeders from popular brands such as Birdfy and Bird Buddy start at around $120 to $200 and are often on sale. Consider features such as camera quality, bird ID capability, solar panels, and cloud storage. Some add-ons or subscriptions may cost extra.

**SOCIALIZE YOUR EXPERIENCE.** Invite a friend to your feeder or share your clips on a public channel. If your feeder has AI, use a field guide to confirm IDs and learn more about birds. Turn to user groups or ask a fellow birder if you’re stumped.

**GO BEYOND A FEEDER.** Growing native plants is the best way to supply wildlife with a varied diet and habitat in the long run. Visit Audubon’s native plants database (**audubon.org/native-plants**) for resources tailored to your region. —*The Editors*

showstopper clips like one of a Northern Flicker under Perkins's feeder, extending its prodigious tongue up and over to lick suet at the top. "I was like, 'Is this some kind of lizard?' " Perkins recalls.

Like the park rangers who run Fat Bear Week, poet and editor Michael Metivier has made social media stars out of his feeder visitors in Vermont. He likes to post videos to BlueSky that he matches with rollicking blues songs or obscure '90s sitcom references, and he gives featured birds punchy nicknames, like Scarlet Joe Handsome and his curious mate, Cardi Bea. Meanwhile, Goldfarb likes to post during migration season—the pictures remind him of the tremendous effort it takes for, say, one Lazuli Bunting to arrive in his yard at all. "That photo you put on Instagram is the end product of one of the animal kingdom's greatest biological achievements," he says. "I find that beautiful to think about."

The fun doesn't have to stop when birders clock in to their jobs. In January, Audubon shorebird program manager Kara Durda started a #birdfeederandnestcameras channel on Audubon's Slack workspace, used for internal communications. Though most colleagues have never met in person, far-flung staff can bond over footage. "It's still very new, but super fun to see the birds that people are experiencing across the country," Durda says.

Today much larger online communities for smart feeder photo sharing, streaming, and discussion exist on Facebook, YouTube, TikTok, and on manufacturers' own apps. And a wide array of smart birding products are hitting the market, including birdbaths, nest boxes, and even binoculars. As more digitally connected gadgets spur natural wonder and foster camaraderie, conservationists also hope to realize additional benefits.

For starters, these devices collect data that could prove useful to scientists. A bigger hope, says Durda, is that consumers initially enticed by flashy technology may feel compelled to take further steps to protect birds and their habitats—by cultivating native plants that provide natural food sources that wildlife needs to thrive, for instance. Her colleague Chad Witko, an avian biology specialist at Audubon, agrees that high-tech feeders could help prompt environmental and climate action. (In fact, that's one of the goals of a recent partnership between the National Audubon Society and Bird Buddy, the smart feeder brand I sent to Nick.)

**SMART FEEDERS HELP MAKE BIRDING EVEN MORE ACCESSIBLE.**

"People will only conserve what they know and love," Witko says. "Being able to connect using these feeders is a huge starting point."

THERE'S NOTHING SCIENTIFIC about the video Nick sent me of his shrieking kids clustered at the window, but it's premium data to me. "Get the food!" my 5-year-old nephew yells at a pair of House Finches. "Get the foooooood!" Finding meaningful time in nature has never required technology, but tech does make vivid moments easier to document and share.

For a device that demands screen time, Nick and Emily's feeder has, surprisingly, strengthened offline bonds. One sidewalk bird chat between Emily and the woman next door led to an impromptu kiddo playdate. And when Nick is at the office, that neighbor's husband, a remote worker, watches from his window and texts my brother (a second set of) feeder updates. The dynamic reminds Emily of the pandemic, when she "ended up spending so much more time talking to our neighbors: a rare positive outcome."

And then there was the Sunday that I called Nick and Emily for a cam report, and we spent a half hour just shooting the breeze. I can't remember the last time we did anything like that without planning it first—maybe never. Emily and I joke about Nick's obsession with House Finches—he imagines them going on dates to his feeder and then rating the experience on House Finch Yelp. We giggle over my niece's blackbird migration theories. When I find a way to slip the pun "there's something for everybirdy" into the conversation, they threaten to hang up.

As we wind down our call, Emily mentions the "bird test": a dating TikTok fad based on a concept from the Gottman Institute, a research group that studies human relationships. It prompts you to assess your partner's devotion by pointing out a bird in the yard and seeing if they follow your gaze out the window. The health of your relationship, according to the test, depends on this shared curiosity, this mutual attention. It's an attention that begins with a bird and then prompts us to tune in to each other.

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**ELENA PASSARELLO** *is an author and teacher whose stories for* Audubon *include a profile of Wisdom, a Laysan Albatross and the world's oldest confirmed wild bird.*

📷 Fans made of Golden Eagle tail sets are vital spiritual objects for a religious ceremony in the Altar Room at Sia, a Comanche culture and raptor conservation center.

# Safeguarding the Sacred

In Oklahoma, a Comanche-led raptor center is carrying the torch for conservation, culture, and "the bird ways."

**BY RACHEL NUWER**
**PHOTOGRAPHY BY JON CHERRY**

> “Historically, the belief of our people is that only the Golden Eagle can fly high enough and far enough to see the face of God.”

ON A BRISK DECEMBER NIGHT, THREE MEN GATHERED in Cyril, a speck of a town in southwest Oklahoma. They had come for a special purpose—one that connected them to their Comanche ancestors and channeled powers beyond the physical realm.

Tonight, they would be “roadmen,” the spiritual leaders of peyote meetings. This ceremonial practice involves all-night sessions of prayer and song at which attendees may consume the psychoactive cactus peyote. Many Indigenous Americans, especially those who are members of the Native American Church, consider it to be integral to their culture. “It’s who we are,” says Charles Tahah, one of the Comanche roadmen present at the demonstration that evening.

Kneeling in a small room painted a brilliant marigold yellow, Tahah and his spiritual brothers, Travis Codynah and Randall Foye, lowered their heads, closed their eyes, and began to sing. They were sharing just a few of the countless “journey songs” that would be sung at an actual peyote meeting. Chanting in Comanche, their voices rose and fell to a rapid beat they kept with a gourd rattle and water drum. Even nonspeakers could pick out one distinctive word in several songs: *Kweeni*, or Golden Eagle. That species’ special energy was also present in fans the men held, each made from a full set of tail feathers. The fans are crucial for peyote meetings: Ceremonial prayers cannot reach the heavens without them. “To anyone else, they’re just feathers, but to us, they’re something special and powerful,” Tahah says. “They’re wind made flesh.”

Virtually all Native American tribes assign special importance to feathers and other parts from a wide array of birds. Feathers are believed to encapsulate the animal’s energy, and they serve different ceremonial purposes, depending on the culture. For Comanches, Golden Eagles are the most cherished. “Historically, the belief of our people is that only the Golden Eagle can fly high enough and far enough to see the face of God,” says Waha Thuweeka, co-director of Sia: The Comanche Nation Ethno-Ornithological Initiative.

Sia, which means “feather,” has captive-bred and released hundreds of Golden and Bald Eagles, helping to rebuild wild populations. The organization is also one of the few places Native Americans can legally obtain feathers for cultural and spiritual purposes, and it runs the only repository of feathers from both eagle and non-eagle species. The feathers in the fans Tahah, Foye, and Codynah used that December evening were molted by Golden Eagles that live at Sia, and the group supplies members of about 150 tribes per year with feathers from a wide range of revered birds.

Sia makes a unique contribution to the ornithological world, says Patrick Redig, cofounder and director emeritus of The Raptor Center at the University of Minnesota. “It’s fundamentally blending the cultural history and importance of the eagle to the Comanche and other Native American tribes, but with an eye to addressing the conservation of the eagle in modern times,” he says. Such an operation “just doesn’t exist elsewhere, and it’s really important to eagles because they need it—they need advocates.”

Eagles face a multitude of threats, including collisions with wind turbines and power lines, lead poisoning, and habitat loss. Now the growing popularity of peyote meetings within and beyond Native communities, as well as an increasing demand for regalia for powwows, is feeding a black market for eagle feathers.

Waha Thuweeka and Troy, Sia’s other co-director (he doesn’t use a surname), have watched as the sale and use of illicit feathers has “exploded,” Troy says, especially in the past couple of years. Deeply concerned about the impact of this escalating illegal trade, they are fighting to save eagles while maintaining their culture. “We live in a time when an eagle can no longer forfeit her life to satisfy culture, not any culture,” Waha Thuweeka says.

GOLDEN EAGLES HAVE ALWAYS BEEN PART OF WAHA Thuweeka’s life. He can trace his family back through seven generations of Numunuh, as Comanches call themselves, on his mother’s side. His family’s historic responsibility was to maintain “the bird ways,” he says.

His German-Irish father had his own obsession with birds and could identify a feather blindfolded, just by its texture. “That’s how I first got to know the birds, through the plumage,” says Waha Thuweeka, whose Anglo name is William Voelker. His father amassed a collection of raptor feathers, including some 2,200 Golden Eagle tail sets, and numerous carcasses—many sent from ranchers when eagle persecution was commonplace, before the government strengthened protections.

Eagles were first federally protected under the 1900 Lacey Act, which bans the trade and transportation of bird parts across state lines or international borders. Then the 1918 Migratory Bird Treaty Act made it illegal to harm, kill, or keep any native migratory bird or part without a permit. But by the 1930s it was clear that stricter

Waha Thuweeka with *Yah pah chony*, or Cricket, a third-generation Golden Eagle bred at Sia, also home to a leucistic Red-tailed Hawk (below) whose poor eyesight would make survival difficult in the wild.

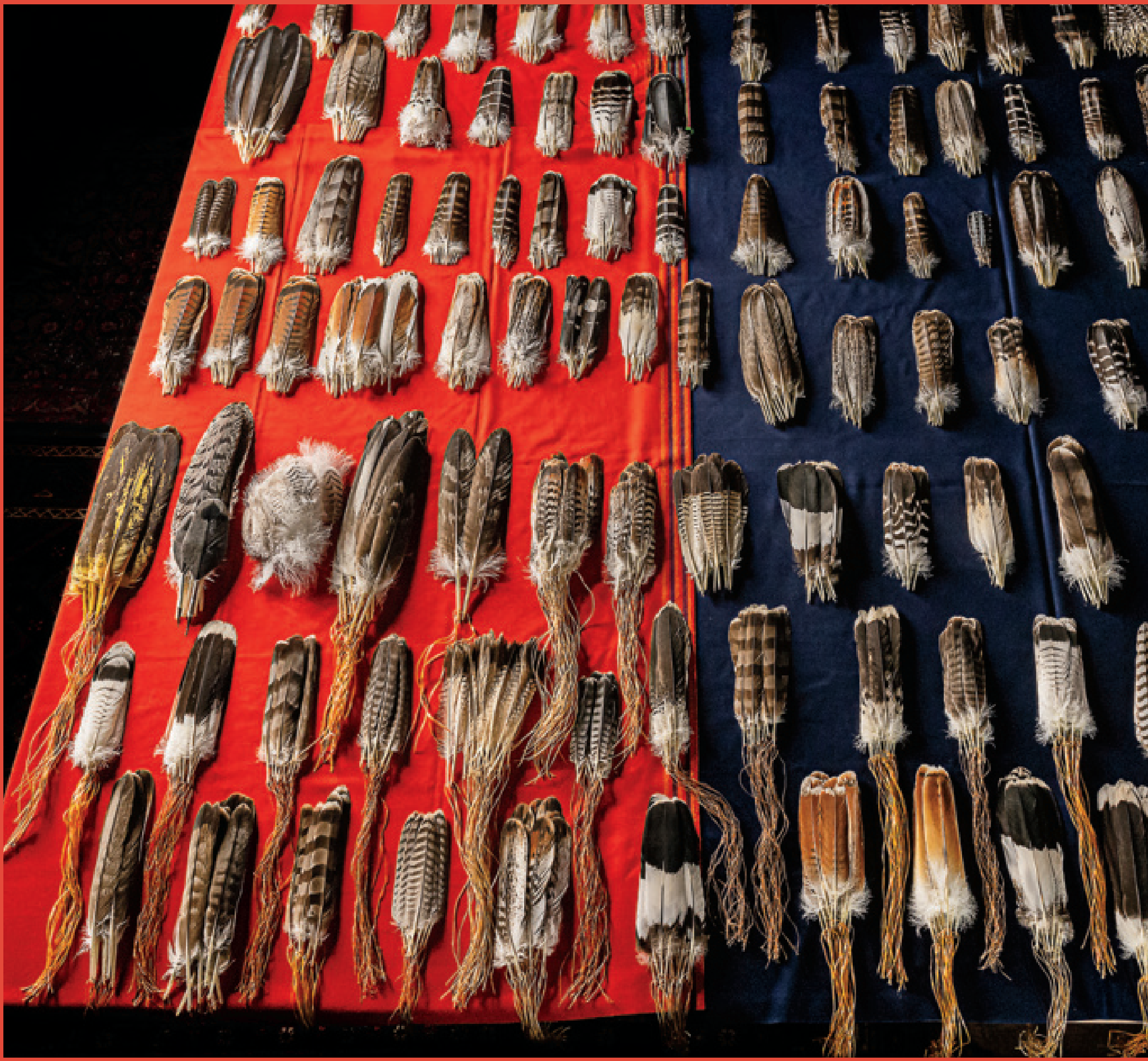
regulations were needed to stem the decline of eagles from rampant shooting and habitat loss. In 1940 the government passed the Bald Eagle Protection Act, adding heftier penalties for harming the birds or possessing or selling their feathers and other parts. For the Golden Eagle Amendment to that act, passed in 1962, Waha Thuweeka's father worked with federal authorities to create language and protocols that supported Native cultural interests, ensuring Native Americans and others could legally keep feathers and parts already in their possession.

In 1972 George Sutton, an acquaintance and leading ornithologist, arranged for Waha Thuweeka to take graduate-level courses at Cornell University. There he shared quarters with Pride, a beloved Golden Eagle he'd brought with him, and studied ornithology, avian physiology, and genetics. He also established connections with prominent raptor experts, including Tom Cade, who founded The Peregrine Fund, a raptor conservation nonprofit.

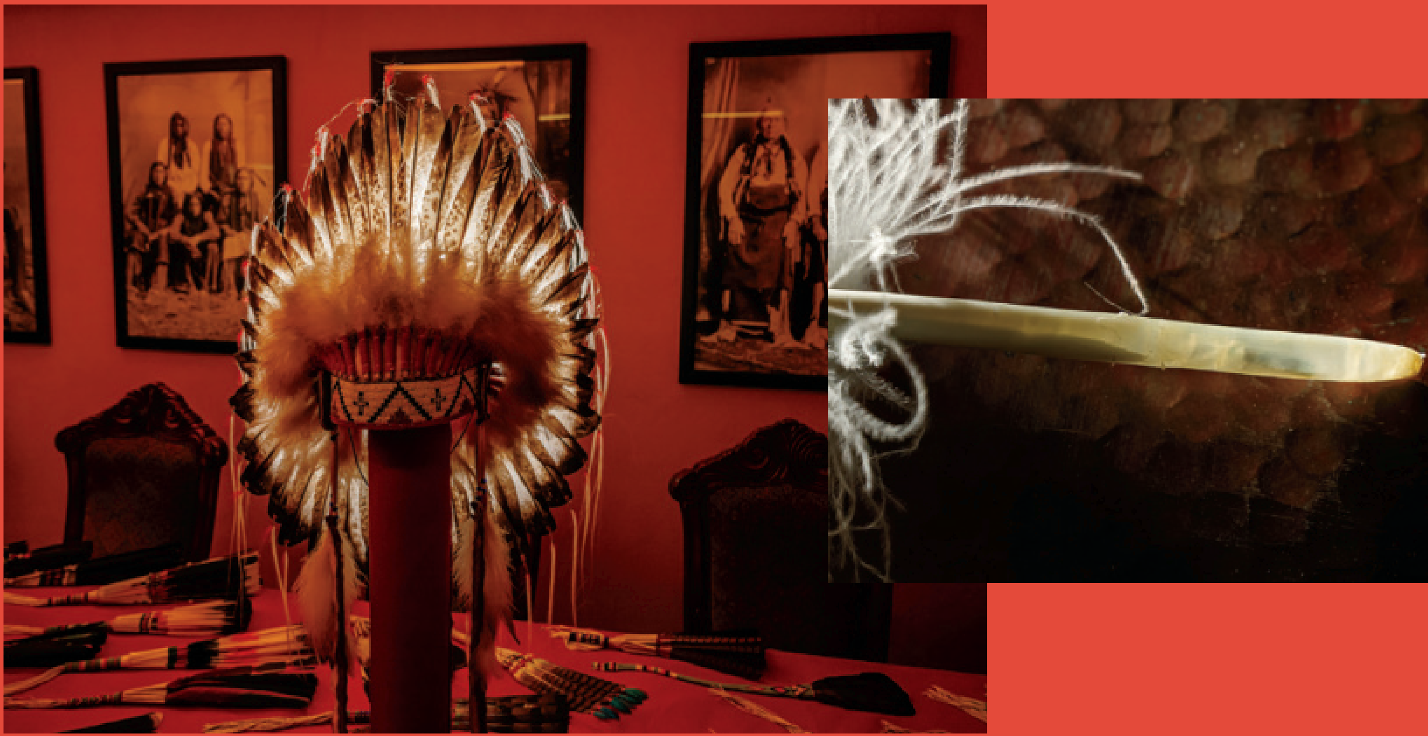
When he returned home, Waha Thuweeka continued working with birds, including through a captive-breeding program and avian surveys. One day, in 1979, he broke a personal rule and picked up a hitchhiker. The young white man was Troy. "There was a baby eagle sitting on the seatback," Troy recalls. "I'm like, 'What the heck is going on here?'"

Waha Thuweeka explained that he was releasing the captive-bred chick into the care of wild foster parents. Troy, who had recently left the Army after being injured in a helicopter crash, was fascinated. That summer he joined Waha Thuweeka on an annual eagle banding survey on Numunuh historic lands. On their final day, tragedy nearly struck when two eaglets jumped from their nest and landed in the North Laramie River. Troy immediately leapt into the fast-flowing water and saved them.

Back at Waha Thuweeka's parents' house, his Grandmother Eviyah summoned Troy to a fire in the backyard and began a ceremony to take him "captive." Only Comanches born prior to the tribe's final surrender to U.S. troops in the late 1800s were permitted to take these captives, a practice historically reserved for young people whose families Comanches had killed. Grandmother Eviyah



Clockwise from top: Feather sets that will become fans, banner lances, or shields are displayed on traditional red (representing day) and blue (for night) cloth. Sia inserts microchips into feathers to confirm their legal provenance. A headdress is among the many ceremonial items in Sia's collection.



was the last Comanche known to invoke this privilege, which made Troy a member of the family and tribe. Though neither man had told her about Troy’s heroism, she named him *Kweeni Mahqueetsoi Okwetuni*, or “he who saves the eagle from the water.”

In addition to monitoring wild eagles, the duo began working to rebuild the raptors’ populations. Employing an artificial insemination technique that Waha Thuweeka had pioneered, they produced and released more than 400 Golden and Bald Eagles into the wild from the 1970s through the early 1990s.

Waha Thuweeka and Troy formalized their efforts in 1999 with the creation of Sia. The center, funded primarily by donations, combines elements of a museum, archive, shrine, botanical garden, and raptor sanctuary. One room is a dedicated research space, packed floor to ceiling with books, historical documents, and photographs related to both eagles and Comanches. Another is a state-of-the-art archival storage facility.

Eagles are at the center of Sia’s operations. Many of the more than 100 resident raptors are captive-bred eagles, some of them descendants of several generations of Comanche birds. Sia also provides a home for some formerly wild birds that cannot be released, especially species significant to Comanches. That includes two wing-injured Harlan’s Hawks, a Crested Caracara born with a feather deformity, and a Zone-tailed Hawk that was hit by a car. Waha Thuweeka and Troy, who don’t give themselves salaries, live on the property. “This is not a job,” Waha Thuweeka says. “This is a hereditary life’s calling.”

Sia’s influence extends far beyond Oklahoma. In 2012 Sia signed an agreement with the Spanish government to establish a joint raptor conservation center in Spain, where they produced Maria, the first captive-bred Spanish Imperial Eagle. That partnership also provides symbolic restitution for the horses and metal that Comanche raiders took from Spanish settlers on the southern Plains three centuries ago, Waha Thuweeka says. In 2016, after several major zoos had failed in the attempt, Sia succeeded in hatching the first captive-bred ‘Io, or Hawaiian Hawk. The center is also the only place in the Western Hemisphere to propagate nonnative species such as Verreaux’s and Steppe Eagles, which it provides to dozens of zoological partners. Sia does “things in this world that nobody else does with raptors,” says Benjamin Tuggle, former Southwest regional director for the U.S. Fish and Wildlife Service (FWS). Waha Thuweeka attributes their success to “listening to the birds,” looking to them for cues that identify their needs in terms of food and habitat.

Even as Sia helped bolster wild eagle populations and build expertise important to raptor conservation, Waha Thuweeka and Troy had a larger, tougher goal—one that married their devotion to eagles with their fervent support of traditional Native practices. For decades, tribes had lacked a way to legally obtain culturally important feathers. Sia wanted to provide a solution to that problem.

> Sia combines elements of a museum, archive, shrine, botanical garden, and raptor sanctuary.

UNDER THE 1962 GOLDEN EAGLE AMENDMENT, THE DEPARTment of the Interior was required to provide tribal members some means for accessing Bald and Golden Eagle feathers and carcasses. Years passed, however, and the department struggled to fulfill that obligation. So around the time Waha Thuweeka went to Cornell University, he sent a proposal to the FWS to create an Indigenous-run feather repository that would build on his father’s substantial collection and help meet the needs of tribes. “Indigenous, traditional practitioners have the experience and understand the nuance of meeting the needs of other traditional practitioners,” Waha Thuweeka says.

The feds weren’t interested, he says. “We heard things like, ‘This is like putting the fox in charge of the henhouse.’ ”

The government met its mandate to tribes by creating the National Eagle Repository in the early 1970s. Now located near Denver, the facility is the national collection point for all deceased Bald and Golden Eagles from local, state, and federal officials, as well as from rehab groups and zoos. Enrolled members of federally recognized tribes can apply to receive a limited number of eagle remains, parts, and feathers for religious purposes. The repository now receives thousands of carcasses a year, but from the beginning it was clear that it couldn’t keep up with demand.

Meanwhile, Waha Thuweeka hadn’t given up on his vision for a fully Native-run feather repository—a mission that Troy also took up when he became a Comanche. Their first success came in the late 1990s, when their years of lobbying the government resulted in the creation of a new federal permit that allows Indigenous entities like Sia to maintain eagle aviaries for Native religious use and distribute molted feathers to tribal members. (To Waha Thuweeka and Troy’s dismay, however, the new permit prohibited the release of any captive-produced young to the wild—something they’d been doing for decades.) The Zuni received the first permit, followed by the Comanche and five other tribes. Even so, with 574 federally recognized tribes in the United States, members must often wait years to obtain the feathers they require.

What’s more, while tribal aviaries helped meet the need for eagle feathers, there was still no legal pipeline for obtaining feathers from other bird species. The Yuchi people, for example, require feathers from the Whooping Crane—a species they believe to have gifted them with ceremonial songs—for spiritual dances. The Wiyot people had likewise long sought California Condor feathers to complete a ceremony that had been abruptly ended in 1860 when a group of white settlers stormed in and killed most of the people in attendance.

As Waha Thuweeka continued to argue that Native Americans needed legal access to feathers from culturally significant birds, Sia found an ally in Tuggle at the FWS. But when Tuggle began trying to push Sia’s feather repository proposal forward in 2009, he, too, met resistance. “Our law enforcement and programmatic people claimed that Sia and the Native American community aren’t capable of doing this,” he says. So Tuggle pushed even harder. “It basically became a mission of will,” he says.

In 2010, thanks to his efforts, the FWS granted Sia a special permit to distribute non-eagle feathers under the Migratory Bird Treaty

Act. (Liberty Wildlife, a non-Indigenous rehab facility in Phoenix, is the only other non-eagle feather repository.) With its two separate permits, today Sia is the only repository for all types of feathers.

Sia stores hundreds of thousands of feathers from more than 200 species in a warehouse offsite. Rehab groups, zoos, and falconers help maintain the supply. Sia fulfills requests from around 150 tribes per year, mainly for raptors but also for songbirds like Blue Jays and Yellow Warblers and galliformes like the Greater Sage-Grouse and Ruffed Grouse, as well as those long-sought condor and crane feathers.

Sia provides all feathers for free, and covers shipping costs out of an abundance of caution for the law. They only supply for bona fide cultural purposes. If there's any doubt as to how feathers will be used, they rely on a verification process using connections within the tribal world. Even so, demand outstrips supply. This is especially true for eagles: Sia can send out feathers only from the 8 Bald Eagles and 20 Golden Eagles currently in its care or from those in its collection that predate the Bald and Golden Eagle Protection Act. Sia is also working to obtain the authority to distribute eagle feathers from other sources, just as the government does through the national repository.

Waha Thuweeka estimates they have a backlog of around 80 eagle applications, which will take a few years to work through. Those outstanding requests are for especially prized juvenile Golden Eagle tail feathers, which are mostly whitish with black tips, unlike the all-dark feathers of adults. (Golden Eagles molt at most six tail feathers a year.) Sia also has 290 applications for non-eagle species that they lack the feathers or carcasses to fulfill, especially adult male Anhinga tail feathers but also some Scissor-tailed Flycatchers, warblers, magpies, ravens, roadrunners, and flickers.

A recent browse of Facebook showed how easy it is to buy illicit feathers.

If Sia can't help, members of tribes that don't keep eagles have to join the yearslong queue at the National Eagle Repository. According to the repository's website, it's only now processing applications filed more than 11 years ago for immature Golden Eagle carcasses. The avian flu outbreak has the potential to further extend wait times because of extra safety measures. For those unwilling to wait, however, there is another option: the feather black market.

HISTORICALLY, COMANCHES OBTAINED FEATHERS PRIMARILY through two means. The first, pit trapping, required a man to hide in a hole covered with brush and topped with the carcass of a prey species; when an eagle landed, he grabbed it by the legs, plucked the feathers he needed, then released the bird. Juvenile feathers, meanwhile, were taken by lethal means from birds that had been rendered flightless by a crop full of food. Holy items made from Golden Eagle feathers were passed down through generations.

Lethal means for procuring feathers are still practiced today—albeit with very different methods. Illegal shooting is a leading cause of death for eagles in the western United States, a 2023 study found. It's also grown more brazen. Last October, for instance, a U.S. district judge in Montana sentenced a man to nearly four years in prison and ordered him to pay more than $775,000 in restitution for killing more than 3,600 birds, including 118 eagles, on the Flathead Indian Reservation. Officers estimated the poacher earned up to $360,000 by selling eagle feathers and parts. "We are going to feel the impacts of the Flathead Reservation's raptor loss for years to come," said Mike Dolson, chairman of the Confederated Salish and Kootenai Tribes, in a statement.

The prosecution was presented as a major success. But as Waha Thuweeka points out, catching poachers doesn't solve the problem. "Yes, stop the people that are killing the birds," he says. "But they wouldn't be killing the birds if there wasn't a market."

According to the Associated Press, the poacher and his collaborators targeted these birds because they're in such high demand for sacred ceremonies and powwows. In the past few years, as mainstream interest in psychedelics has surged, peyote ceremonies have proliferated among Native Americans and others. Demand for feather fans has risen in turn. Even greater demand for feathers is driven by powwows. At these gatherings, dancers adorned in costumes that often include multitudes of eagle and other raptor feathers compete for cash prizes that can climb into the tens of thousands of dollars. The country's largest powwow, held in Albuquerque, draws more than 100,000 attendees and 4 million livestream viewers. Dancers know that "if they're dripping in feathers, they're more likely to get the attention of the judges," Waha Thuweeka says.

A recent browse of Facebook showed how easy it is to buy illicit feathers. In a 5,000-member Native American Church–themed group, post after post advertised feathers for sale, some loose, others made into fans. Most were from Golden or Bald Eagles, but there were also feathers from corvids and Scissor-tailed Flycatchers. "Felonious activity," Waha Thuweeka said as he scrolled past a set of tail feathers from a first-year Golden Eagle. He could tell by the quills that they weren't molted feathers, he said, but ones "from a bird that's freshly killed." Sellers usually ask interested parties to message them directly for prices, but Waha Thuweeka has been told that a set of juvenile Golden Eagle tail feathers can sell for up to $1,200 to buyers in the powwow world.

In 2022 administrators from Meta approached Waha Thuweeka after he was quoted in a *Los Angeles Times* article about peyote. They wanted his help finding and removing Facebook posts advertising peyote and other natural hallucinogens. He says he raised the issue of black market feathers on an initial phone call, and "they said they would look at it." Although the Meta team was at first diligent about taking down peyote posts he flagged, he says, they never took down any of the illegal feather offerings he pointed them to. He emailed them again in December. "The illegal offerings have grown on Facebook, and something needs to be done," he wrote. He never received a response.

*Audubon* reached out to both of the members of Meta's policy development team Waha Thuweeka had worked with. One responded and directed *Audubon* to the company's press office for interview requests. The press office never responded.

When it comes to federal law enforcement cracking down on illicit online sales, Laury Marshall, now former assistant chief of public affairs for the FWS, said in an email that the agency conducts "many investigations into the purchasers of eagle feathers and parts." Violators usually receive verbal warnings or tickets. She added, however, that the FWS does not have the personnel to undertake time-consuming investigations of the eagle trade on social media. The FWS did not respond to follow-up questions.

WAHA THUWEEKA AND TROY HAVE STARTED PURSUING their own solutions. They now implant all of the feathers and feather-containing items they send out with microchips linked to a registry that confirms their legal provenance. The chips could make it easier for FWS agents to identify legally acquired feathers, if and when they begin cracking down on the

In the Altar Room, surrounded by historical Comanche items and gifts from international visitors, Troy holds Wahine, a Hawaiian Hawk hatched at Sia in 2016.

illegal trade, Waha Thuweeka says. FWS law enforcement staff came to Sia for a demonstration in 2010, but the agency didn't respond to a request for comment about the technology.

Sia also engages in outreach and educational programs with tribal, national, and international groups, and these efforts seem to be making some difference. "The Pueblos are starting to think about getting feathers and other things from places like Sia, rather than going out to poach," says Mary Motah Weahkee, a retired archaeologist and member of the Comanche Nation and the Santa Clara Pueblo.

Another solution Sia has long advocated is creating a network of regional feather repositories for both eagle and non-eagle species. Sia would provide training and advice, if desired. Tribes would obtain feathers from the same places Sia currently does—rehabbers, falconers, zoos, and more—but would work with partners in their area. Not only would this help meet demand, it would also empower tribes to take control of the sourcing of their sacred items. In addition, it could give value to the countless carcasses and feathers from birds other than Golden and Bald Eagles that are currently thrown out or incinerated around the country. "Imagine if every tribe did this with their own feathers," Troy says. "It would be regenerative. No birds would have to be killed."

Making this vision a reality would require people who are as committed as Waha Thuweeka and Troy. While Western society tends to see Native American culture as something from the past, a growing number of younger Native people like Tahah, Foye, and Codynah are devoted to revitalizing an older, more culturally authentic way of doing things. "They give us some hope of these ways continuing," Waha Thuweeka says.

Another hopeful portent came in April. The FWS granted Sia authority to release unlimited numbers of captive-produced Bald and Golden Eagles on historic Numunuh lands in six states, from Texas to Montana, for 30 years.

The permit "signals a return to Indigenous people engaging in the truest form of conservation of species for which we depend culturally and spiritually," Waha Thuweeka says. It is also a victory for "the sanctity of eagle life."

As long as eagles soar and Comanches call on their energy, at Sia "the bird ways," too, will still be fiercely alive. Ⓐ

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*Freelancer* **RACHEL NUWER***'s last* Audubon *feature, about bird poaching in Cyprus, ran in the Summer 2024 issue.* **JON CHERRY** *is a Pulitzer Prize–winning photojournalist whose work explores the intersection of environment, identity, and the human condition.*

CONSERVATION

# RISKY BUSINESS

A new push to unleash oil and gas drilling, mining, and logging in Alaska threatens irreparable damage to globally important ecosystems.

**BY ANDY MCGLASHEN AND ALISA OPAR**

THE FIRST WEEK OF THE SECOND TRUMP PRESIDENCY featured a firehose of executive orders targeting climate programs, environmental justice efforts, and much more. One order stood out because it was focused not on a particular policy issue, but on a specific place. Its title: Unleashing Alaska's Extraordinary Resource Potential.

By signing the order, President Trump turned up the heat on long-simmering debates about how to weigh natural resource extraction in Alaska—the bedrock of the state's economy—against environmental protection in what are some of the nation's most spectacular wild places. The areas singled out for development are like vital organs that sustain vast migrations and entire ecosystems, says David Krause, vice president of Audubon's Alaska program. For myriad bird species, for instance, these plains and forests and wetlands are of crucial, hemispheric significance for breeding and staging during migration. What's more, these diverse ecosystems play a significant role in the global climate, locking up vast amounts of carbon. "All of these areas are integral to the systems that make Alaska unique and special," Krause says. "They are the core areas of ecological importance that can't be compromised."

Executive orders are not laws, but they are nonetheless consequential statements of a president's policies and directions for federal agencies to carry them out. The moves for Alaska that Trump laid out in January are nothing new—they revive actions that the Biden administration scrapped and that courts have overturned—and opponents say they are prepared to push back. "We're going to continue to fight for the protections that we know are supported under the law," says Siobhan McIntyre, staff attorney with the nonprofit Trustees for Alaska.

But because the first Trump administration already laid the groundwork for these projects and policies, environmental and Indigenous activists fear that things could move more quickly this time around, resulting in lasting damage. Here we explore some of the landscapes where drilling, logging, and roadbuilding could soon begin, as well as what's at stake for the birds and people that have made these places home for untold generations.

THE AREAS SINGLED OUT FOR DEVELOPMENT ARE LIKE VITAL ORGANS THAT SUSTAIN VAST MIGRATIONS AND ENTIRE ECOSYSTEMS.

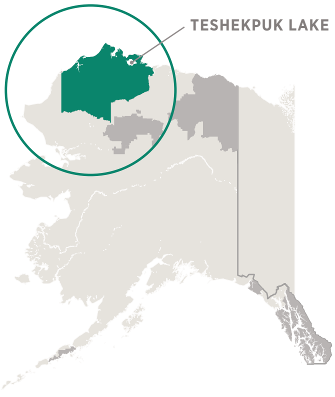
PHOTOGRAPH BY FLORIAN SCHULZ

In late June the Arctic National Wildlife Refuge's coastal plain hosts caribou, dozens of nesting bird species, and an array of other animals.

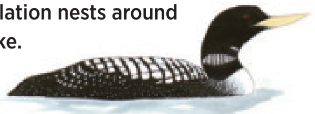
The Teshekpuk Lake area provides food and safety for Greater White-fronted Geese rendered flightless during their weeks-long molt.

# NATIONAL PETROLEUM RESERVE-ALASKA

Oil infrastructure endangers irreplaceable wetlands.



The largest of the five loon species, most **Yellow-billed Loons** winter along the Southeast Alaska and British Columbia coasts. Come spring, much of Alaska's population nests around Teshekpuk Lake.



**THE NATION'S LARGEST TRACT OF** federal land has a public relations problem. It's so remote that few visitors ever reach it, and those who do must endure unearthly cold or hellish hordes of mosquitoes. And then there's the industrial-sounding name: the National Petroleum Reserve-Alaska.

Set aside in 1923 as an emergency fuel source for the U.S. Navy, these 23 million acres rest atop reportedly vast, largely untapped oil deposits. At the same time, the land's ecological importance—and its cultural value for the region's Indigenous people—is difficult to overstate. "In terms of that nexus and those values overlapping, this is definitely ground zero," Krause says. "It's also a very, very fragile landscape."

Recent administrations have sought to balance development—such as the controversial Willow oil project that President Biden approved in 2023—with tough restrictions to protect the reserve's most sensitive areas. Trump's stance, on the other hand, is that up to 82 percent of the NPR-A should be open for business.

Wildlife advocates fear that in addition to climate-warming impacts, oil extraction will leave the tundra habitat spiderwebbed with infrastructure. The industry's interest in drilling around Teshekpuk Lake is especially alarming: The area hosts awesome avian spectacles, including 600,000 breeding shorebirds and up to 100,000 molting geese—birds that disperse to six continents come fall. The caribou that calve there each spring also provide a priceless resource for subsistence communities.

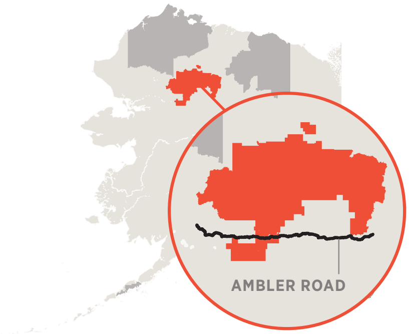
Since ConocoPhillips began operating the first wells there in 2015, oil infrastructure has crept farther into the reserve, and locals are already feeling the impacts. "Some people are not able to get to their campgrounds, their hunting grounds that have sustained them for time immemorial," says Nauri Simmonds, executive director of Sovereign Iñupiat for a Living Arctic, an advocacy group. "Being cut off from that area is like losing part of your homeland."

Still, many Alaska Natives welcome industry interest, given the economic windfall drilling can bring to local communities. "It's hard to think about seven generations into the future when you're just trying to survive," Simmonds says. But even some who support energy projects have been dismayed by Trump's no-holds-barred approach to developing the reserve, she says. "Hopefully this will be the alarm that brings us back to center so we can recover what we have."

PHOTOS FROM LEFT: FLORIAN SCHULZ; NATHANIEL WILDER. ILLUSTRATIONS: DAVID ALLEN SIBLEY. MAPS: JULIE ROSSMAN/AUDUBON. DATA: ESRI, U.S. FISH & WILDLIFE SERVICE, ALASKA REGION, DIVISION OF REALTY, ANCHORAGE, AK.

# GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE

Mining operations threaten to cut across key migratory pathways.



In summer the **Olive-sided Flycatcher**'s distinctive *quick, three beers!* whistle rings out in the Brooks Range's coniferous forests. The bird has become noticeably less common in Alaska in recent years, perhaps due to the drying of boreal wetlands and lakes it uses for breeding.

**AN ELDER ONCE TOLD BRIAN RIDLEY** that even though he had lived through the Great Depression, he hadn't felt its effects—salmon and caribou had sustained his people, as they had for millennia. The comment resonates with Ridley because that resiliency no longer exists. Climate change has contributed to the collapse of Yukon River salmon, a vital food source for the 37 tribes whose needs Ridley works to meet as chief of the Tanana Chiefs Conference (TCC).

Now a controversial project in the foothills of the Brooks Range could put salmon, caribou, and the Native communities that depend on them at greater risk. Trump's day-one order reinstates crucial permits for building a 211-mile-long private, industrial road connecting the Dalton Highway to multiple proposed open-pit copper mines. The Ambler Access Project would cut through state, Native, and federal lands, including 26 miles of Gates of the Arctic National Park and Preserve. Last year the Biden administration effectively killed the project by overturning a 2020 permit for the road approved by the first Trump administration. The permit denial cited a litany of negative impacts, including habitat fragmentation and degradation, air and water pollution, accelerated permafrost thawing, and cultural disruptions.

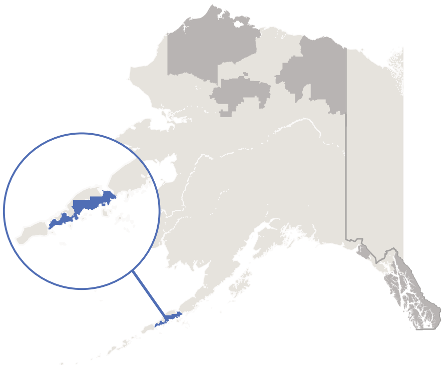
The 450-foot-wide easement would cross 11 major rivers and thousands of streams, potentially polluting or blocking salmon and sheefish spawning grounds and interrupting the migration route of the 150,000-head Western Arctic caribou herd. But the road, the bulk of which goes through the TCC region, could be only the beginning, Ridley says. "Our fear isn't just the road, or that there might be a big mine at the end of the road. It's that we could have hundreds of mines all throughout those tributaries."

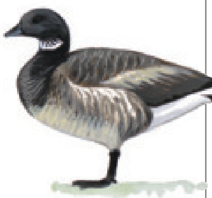
Outside the government and industry, there's little support for the project. Tribal organizations representing 90 Alaska Native and First Nations governments have passed resolutions opposing Ambler Road. "It's a bad investment for Alaska," says Alex Johnson, a campaign director for the National Parks Conservation Association. Johnson leads Defend the Brooks Range, a coalition of tribal leaders, community members, fiscal responsibility advocates, and conservation groups, including Audubon. "The numbers really just don't pan out." The state, which would cover the estimated $2 billion price tag to build and maintain the road, estimates it would break even in 30 years, assuming four major mines are built. To date, no company has applied for a mining permit.

The Ambler Road would traverse the Brooks Range, opening a now-roadless region to industrial mining.

# IZEMBEK NATIONAL WILDLIFE REFUGE

A land swap puts a world-class migratory stopover site and other protected places at risk.





For weeks in fall, 130,000 or more **Brant** gorge on eelgrass at Izembek, replenishing themselves after their heavy molt; about one-third of all Pacific Brant molt on Teshekpuk Lake in the NPR-A.

**TO A MIGRATING BRANT, NO PLACE** on Earth looks as inviting as Izembek National Wildlife Refuge. Although the refuge, at roughly 310,000 acres, is Alaska's smallest, it offers sprawling beds of nutritious eelgrass. So rich is the buffet that after they breed in the Arctic and other points north, nearly all Pacific Brant gather at Izembek to fatten up for the rest of their migration to Baja California.

This unparalleled bounty has sustained Brant, Emperor Geese, and other waterfowl for millennia, but now its future is uncertain. Trump's day-one executive order directed the Interior Department to "facilitate the expedited development" of a gravel road that would run for 11 miles through the refuge. Residents of the isolated, mostly Aleut community of King Cove say they need the road to the all-weather airport in Cold Bay to access emergency medical care. First proposed in 2009, the road has been debated since long before Trump took office; President Biden gave it his backing before leaving office.

Conservationists warn that the project could set a precedent that could lead to habitat destruction far beyond Izembek. That's because the plan to build it involves a land swap: The Native-owned King Cove Corp. would give 31,198 acres to the refuge system in exchange for the 490 acres needed to build the road. Congress designated that land and nearly all of Izembek as wilderness, and Interior's ceding it without congressional approval would set a dangerous example, legal experts say. "If this land exchange goes forward, then all of a sudden you're going to have corporations knocking on the door for an exchange in potentially every national park and national wildlife refuge across the state," says Bridget Psarianos, a senior staff attorney at Trustees for Alaska.

The road's opponents say the transportation problem can be better solved with a ferry, which would not pose the same threat to migratory birds and other wildlife. Several Indigenous communities have issued resolutions opposing the road's construction, pointing to the vital role Brant and other waterfowl have long played in their culture and food security. "We're a community that mostly relies on seasonal foods, and especially the birds during spring and fall," says Edgar Tall, tribal chief in the Native Village of Hooper Bay. "If the animals don't come back, how else are the people going to survive?"

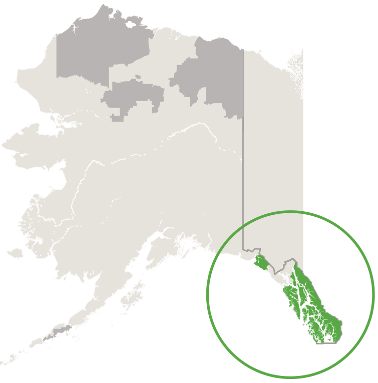
A proposed road would slice across this part of Izembek, where waterfowl and shorebirds nest, forage, and overwinter.

PHOTOS FROM LEFT: ACACIA JOHNSON; SYDNEY WALSH/AUDUBON. ILLUSTRATIONS: DAVID ALLEN SIBLEY. MAPS: JULIE ROSSMAN/AUDUBON. DATA: ESRI, U.S. FISH & WILDLIFE SERVICE, ALASKA REGION, DIVISION OF REALTY, ANCHORAGE, AK.

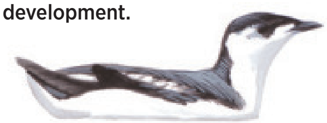
In spring, Marbled Murrelets molt bright white feathers for brown breeding plumage that camouflages them in the Tongass's old-growth forests where they nest.

# TONGASS NATIONAL FOREST

Logging and mining could fracture a globally unique rainforest.



The ancient forests of the Tongass support the world's highest densities of **Marbled Murrelets**, small seabirds that nest in old-growth trees threatened by logging and coastal development.



**IN LATE MARCH, GORDON CHEW** watched orcas pursuing seals from his home on Tenakee Inlet in Southeast Alaska. "It's incredibly diverse and wild," he says. "We've got Snow Geese coming through now, Sandhill Cranes any day."

Chew lives in the Tongass National Forest—some 17 million acres spread across the rugged panhandle and 1,100 islands that support six salmon species, Sitka black-tailed deer, and American Goshawks. Chew's livelihood depends on the forest: His logging company supplies local contractors and Native carvers with timber. Sustainability is key, he says. They take at most one in three trees, each selected by the Forest Service, and are transitioning to cutting young-growth trees. It's a small operation in an industry that has shrunk dramatically since the 1990s, when subsidies and high harvest rates fueled the clear-cutting of many of the biggest old-growth trees. Even so, the Tongass is the world's largest intact temperate rainforest.

Trump wants to resuscitate the once-dominant timber industry. In addition to expanding logging in national forests, the White House is seeking to rescind the 2001 Roadless Rule, which prohibits industrial roadbuilding and logging on nearly 9.4 million acres of the Tongass. In his first term, Trump repealed the rule, which Biden largely restored. Trump's new plans could open more than half of the forest for logging as well as mining for metals.

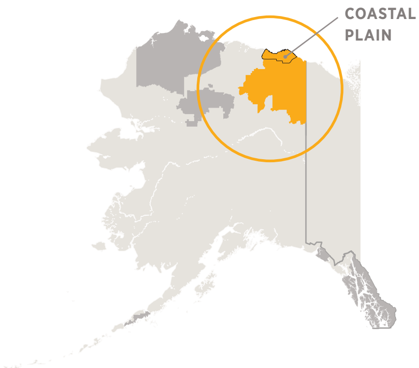
Chew and other Roadless Rule advocates say such activities could have serious repercussions. Jen Leahy, Trout Unlimited's Alaska policy director, points to a report by Audubon and The Nature Conservancy identifying 77 Tongass watersheds, largely within roadless areas, that aren't protected from development. "New roadbuilding and clearcuts could negatively impact important salmon and deer habitat, which could undermine Southeast Alaska's economy and rural food security," she says.

As logging has waned, locals have turned to businesses that rely on conserving trees rather than cutting them. In 2021 Sealaska, an Alaska Native corporation, ended its Tongass timber operations, investing instead in ventures that support ocean health. Today nearly 1.7 million people visit the Tongass annually, and fishing and tourism provide a quarter of the region's jobs. The habitat conservation critical to sustaining those industries has benefits that extend far beyond Alaska. The Tongass holds 20 percent of all carbon stored by U.S. national forests, making it a natural bulwark against global climate change.

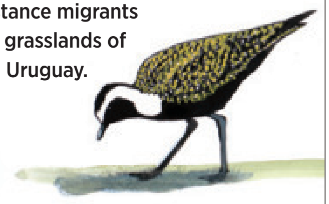
A King Eider and Surf Scoters fly over the Beaufort Sea along the Arctic National Wildlife Refuge coastline.

# ARCTIC NATIONAL WILDLIFE REFUGE

Fossil fuel development jeopardizes breeding grounds for an array of wildlife.



Nearly one-tenth of **American Golden-Plovers** nest on the coastal plain. After breeding season, these long-distance migrants journey to the grasslands of Argentina and Uruguay.



**EVER SINCE THE CREATION OF THE** Arctic National Wildlife Refuge in 1980, a swath of the spectacular landscape has been in a contentious limbo. While most of the 19.6-million-acre refuge is designated as wilderness and therefore off-limits to development, some 1.5 million acres along the shore, known as the coastal plain, don't have that protected status. As a result, politicians have seesawed between safeguarding the area as one of the wildest places on Earth and seeking to tap it for oil. "This is an incredibly unique place on the planet," says David Krause. "Just like Yellowstone or the Grand Canyon, the refuge is part of the nation's natural heritage and is not suitable for resource extraction."

So far the battle over the coastal plain—a roadless mosaic of tundra, lakes, and wetlands where polar bears den, caribou give birth, and 70 bird species nest—hasn't led to any oil development. The first-ever lease sale, under the first Trump administration, generated a scant $14.4 million in bids; the Biden administration later canceled the leases, calling the sale "seriously flawed." A second auction in January, mandated by Congress, got zero bids. "It's high conflict, it's expensive, and there are cheaper places to produce hydrocarbons," Krause says, explaining the lack of interest. Nevertheless, Trump's executive order endeavors to open the entire coastal plain to oil and gas development.

If developers are enticed, it could have enormous ecological and cultural ramifications. The coastal plain is already experiencing dramatic effects of a changing climate, including thawing permafrost that, in turn, releases heat-trapping methane and further accelerates warming. The infrastructure needed for exploration and drilling would spur more thawing and could affect the survival of the Porcupine caribou herd, according to NOAA.

That herd is essential to the Gwich'in people. "Our main source of food is caribou," says Kristen Moreland, executive director of the Gwich'in Steering Committee, which formed in 1988 to fight fossil fuel development on the coastal plain. "They provide us with tools, clothing, our teachings to our children, our connection to the land." The coastal plain is so precious to Moreland's people that they call it *Iizhik Gwats'an Gwandaii Goodlit*, the sacred place where life begins. "Our future generations mean the world to us," she says. "We have to keep fighting for this land—for our people and for everyone else."

PHOTO: MALKOLM BOOTHROYD. ILLUSTRATION: DAVID ALLEN SIBLEY. MAP: JULIE ROSSMAN/AUDUBON.
DATA: ESRI; U.S. FISH & WILDLIFE SERVICE, ALASKA REGION, DIVISION OF REALTY, ANCHORAGE, AK.

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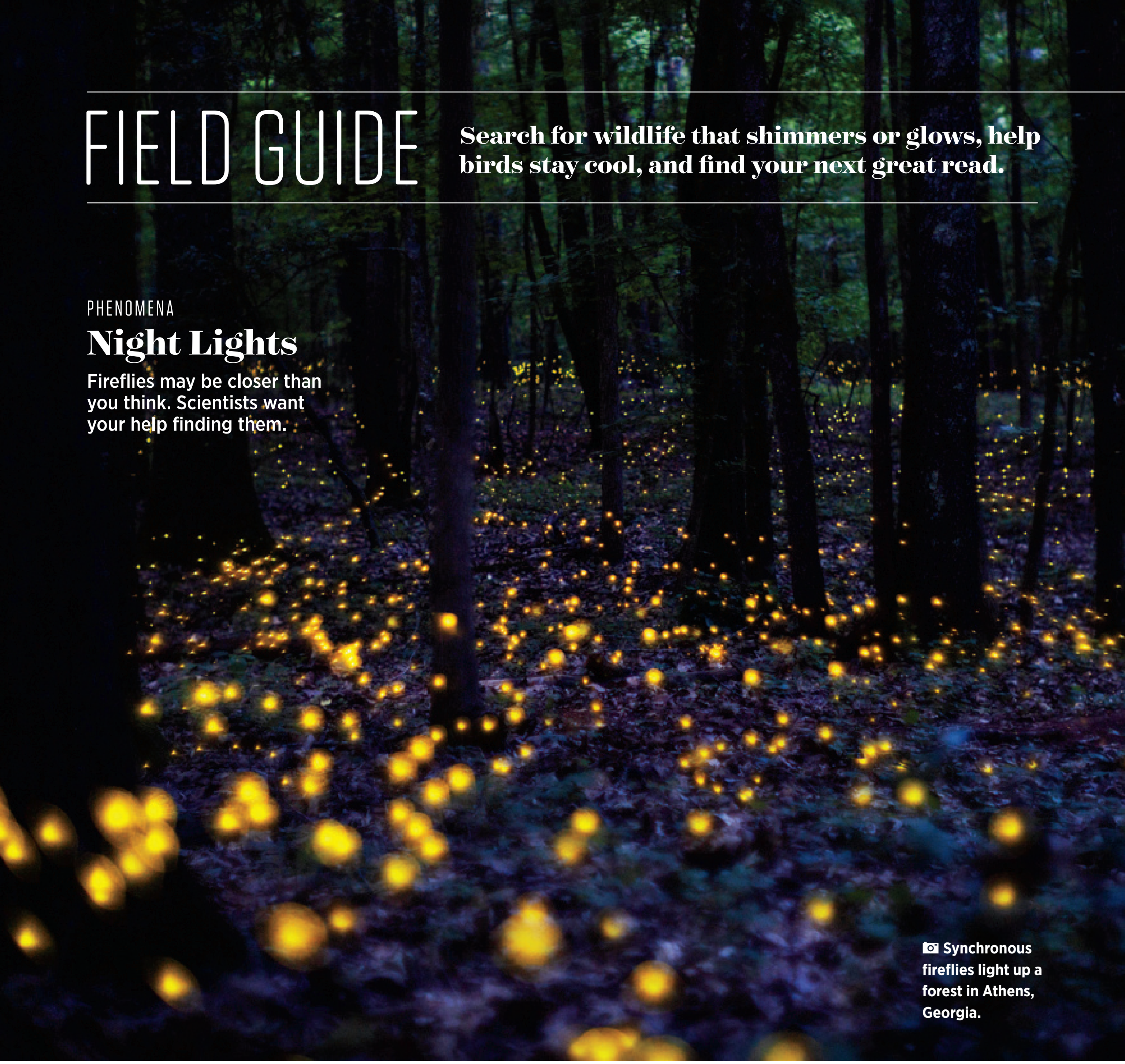
RED-NECKED GREBES. PHOTO: EDWIN LIU/AUDUBON PHOTOGRAPHY AWARDS

Audubon

# FIELD GUIDE

Search for wildlife that shimmers or glows, help birds stay cool, and find your next great read.



PHENOMENA

## Night Lights

Fireflies may be closer than you think. Scientists want your help finding them.

**Synchronous fireflies light up a forest in Athens, Georgia.**

PHOTO: MARK MAGNARELLA

**ALMOST A DECADE AGO,** staff at the Audubon Center and Sanctuary at Francis Beidler Forest were lingering in the parking lot to debrief the night's "Wine and Warblers" event. Then the fireflies appeared. The group stayed for another 45 minutes, amazed by the light show. From this spectacle, an idea was hatched.

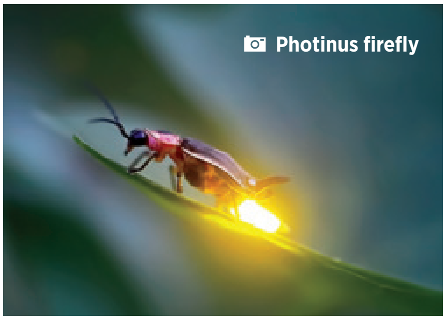
Today hundreds of people head to the South Carolina center every year for "Firefly Nights." Visitors watch lightning bugs blink in synchrony in the old-growth forest, which also offers refuge to more than 150 bird species, including Wood Storks and the striking yellow "swamp candle," or Prothonotary Warbler. Eager attendees share nostalgia, as well as a worry.

"I can't tell you how many people come that are like, 'I grew up seeing fireflies, and I don't see as many now,'" says Matt Johnson, the center's director.

Candace Fallon, a conservation biologist at the Xerces Society for Invertebrate Conservation, had long heard similar concerns. But when she checked the literature in 2018, she found there was no comprehensive population data for any of the country's 179 known firefly species.

Fallon and a team set out to determine how U.S. fireflies are faring. In 2021 they published their findings. Of the 132 species they reviewed, more than half lacked enough data to conclude anything for certain. But among the species whose status was clear, the scientists found 20 to be threatened or near threatened.

Fireflies, which are actually bioluminescent beetles, face many of the same threats as birds. Development, rising seas, and extreme weather events all destroy habitat for birds and fireflies. Pesticides kill insect prey that both fireflies and birds rely on—and likely fireflies themselves. Light pollution, which can disorient nocturnal migratory birds and



contribute to fatal building collisions, also disrupts lightning bugs' ability to communicate: Flashing in a brightly lit environment is like trying to yell across a crowd.

To help fill critical knowledge gaps, researchers are turning to community science. The Fireflyers International Network collects data on iNaturalist from all over the world, and in 2022 Fallon and the Xerces Society launched the Firefly Atlas, where U.S. participants can share incidental observations and even conduct field surveys. These crowdsourced records can illuminate how species are trending in the face of threats.

In some parts of the country, community scientists are logging the first records of fireflies. In the West, the flashing beetles are such a rare sight that some people believe they are imaginary. "It's like: unicorns, dragons, fireflies," says Christy Bills, an entomologist at the Natural History Museum of Utah. Western fireflies have always been harder to find: They appear late at night, in small numbers, and in marshy areas where people don't often hang out. So Bills and her partners at Brigham Young University started the Western Firefly Project to focus attention on them. Today its participants have spotted fireflies in 27 of 29 counties in Utah, where previously there had been only a few documented sightings—and in Idaho, Wyoming, and Montana.

If you'd like to join the effort, or just enjoy the radiance, you likely won't have to travel far. Fireflies live in every state except Hawaii. Timing varies, but the flashing adults tend to appear for about a month in late spring and summer. On a fair night, in a dark, damp area that's not degraded, "chances are you're probably gonna see something," says Fallon. But leave the jars at home. "It's one of the few bugs I ask people not to catch," says Bills.

While some firefly populations are indeed declining, Fallon believes the sense of loss also stems from our own behavior. "We don't spend as much time outside without lights," she says. "It's really easy to not even notice the fireflies around you." Those who take the time to look into the dark may find it deeply rewarding—which explains why Beidler's firefly events typically sell out within days.

"I wish that I could tell everybody, 'Come see this with me,'" says Bills. "It feels like stars have fallen down into this meadow and are twinkling just for you." —*Anna Gibbs*

TAKE ACTION

## Three Ways to Help Fireflies—and Birds, Too

**TURN OFF OUTDOOR LIGHTS AT NIGHT.**
"Unlike so many of the other threats that fireflies face, you can just turn off a light and the threat is gone," says Fallon. Even just closing curtains at night can help both birds and bugs.

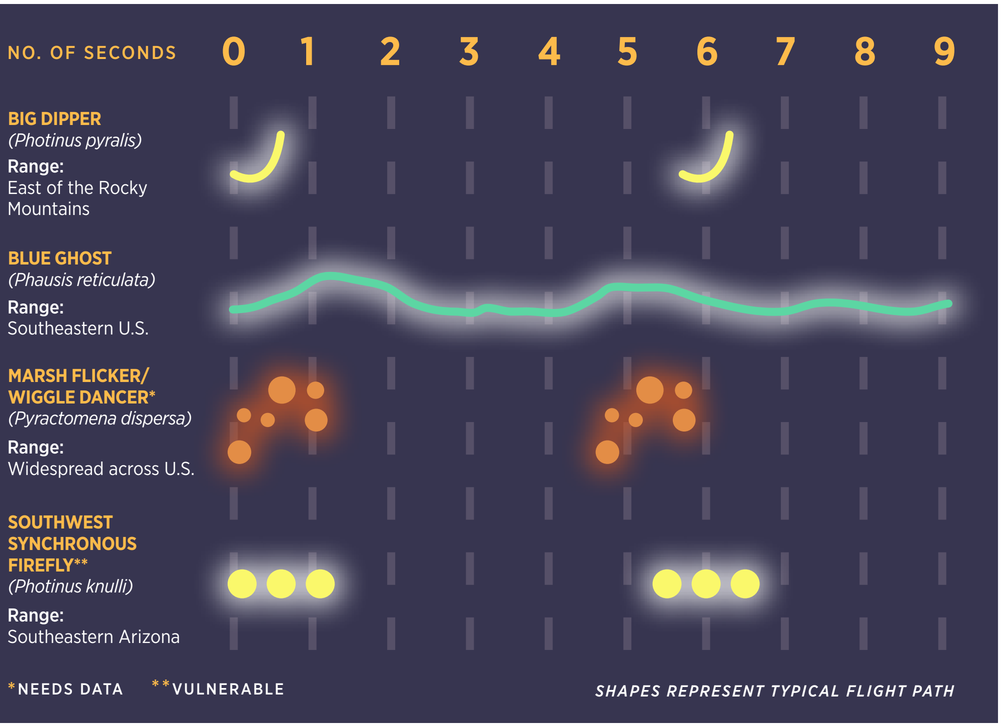
**GROW WILD!**
Unlike a manicured lawn, a garden full of native plants supports birds and pollinators while giving fireflies plenty of places to perch. Avoid pesticides and leave leaf litter in place to shelter firefly larvae.

**SHARE YOUR SIGHTINGS.**
Help fill data gaps by reporting your wildlife findings on community science platforms such as Firefly Atlas and eBird.

IN THE FIELD

## Flash Cards

Much like a bird's song, a firefly's flash pattern can help you identify its species.



**BIG DIPPER**
*(Photinus pyralis)*
**Range:**
East of the Rocky Mountains

**BLUE GHOST**
*(Phausis reticulata)*
**Range:**
Southeastern U.S.

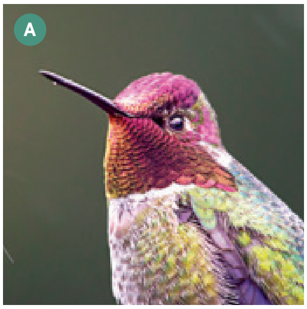
**MARSH FLICKER/ WIGGLE DANCER***
*(Pyractomena dispersa)*
**Range:**
Widespread across U.S.

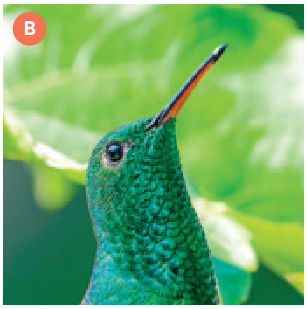
**SOUTHWEST SYNCHRONOUS FIREFLY****
*(Photinus knulli)*
**Range:**
Southeastern Arizona

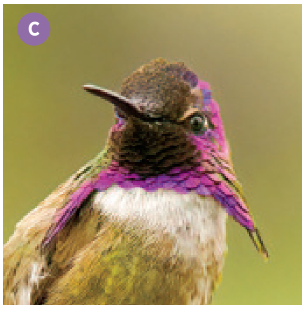
*NEEDS DATA **VULNERABLE

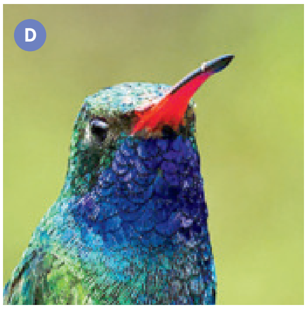
*SHAPES REPRESENT TYPICAL FLIGHT PATH*

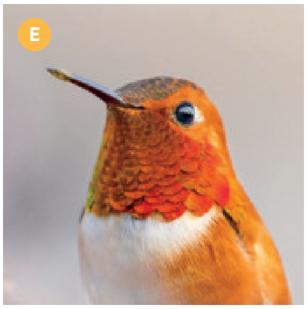
PHOTO: RADIM SCHREIBER/FIREFLYEXPERIENCE.ORG

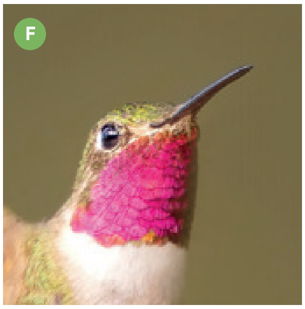


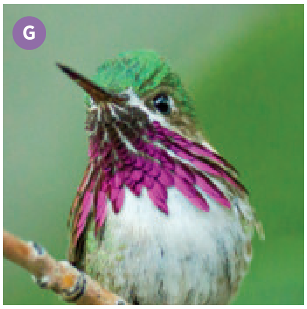


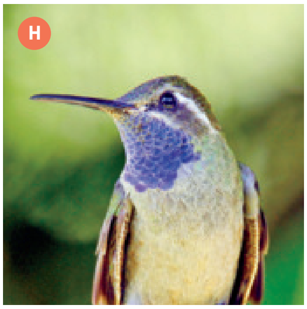












WHO'S WHO

Can you name these western hummingbirds?

(ANSWERS BELOW)

BIRDING

# Have a Hummer Summer

To witness a dazzling variety of hummingbirds on the move, the western United States is the place to be.

**EVERYONE KNOWS** hummingbirds are special—they can fly backward, dive at 60 mph, and slurp nectar from more than 1,000 flowers a day, after all. But you might not realize hummers are a Western Hemisphere specialty: Every species, all 350-plus of them, lives exclusively in the Americas. Of those, 14 can be found regularly in the western United States. That diversity, paired with the birds' uncommonly early "fall" migration, offers chances in summer to catch a kaleidoscopic variety of hummingbirds at numerous locations across the West.

While not all western hummingbirds migrate, many that do begin their southward journeys in high summer to beat autumn's drop-off in blooms. Male Rufous Hummingbirds, for example, depart Northwest breeding grounds by the end of June. Females and juveniles follow in July and August, when Broad-tailed and Allen's Hummingbirds are also on the move. Even Black-chinned Hummingbirds, comparative dawdlers, are largely southbound by August.

To hit the hottest of all hotspots, head to southeast Arizona's Sky Islands, a series of mountain ranges surrounded by lowland "seas" of desert or grasslands. (The West's impressive hummingbird diversity is due in part to its wide variety of habitats.) By July, monsoon season brings a burst of vegetation and insects—perfect for local breeders such as Violet-crowned Hummingbirds, says Sheri Williamson, author of *A Field Guide to Hummingbirds of North America*. Migrants from farther north also take advantage on their journeys, as well as exciting vagrants from south of the border, including Berylline and White-eared Hummingbirds and Plain-capped Starthroats.

Other hummer hubs worth checking out include Davis Mountains State Park, in western Texas; Cabrillo National Monument, in San Diego; and Estes Park, Colorado. Wherever you go, for your best shot at hummingbird variety, visit a feeding station. At Santa Rita Lodge, south of Tucson, you can regularly see six to nine species at the feeders, says birding guide and wildlife biologist David Griffin, while in some Colorado mountain towns, "you could have, like, 100 Broad-tailed Hummingbirds coming to a feeder station," as well as Rufous, Calliope, and Black-chinned.

Want company? Convene with other hummingbird lovers to enjoy workshops and field trips held throughout the summer. In Arizona alone, options include the Sedona Hummingbird Festival (July 25–27), Southwest Wings in Sierra Vista (July 30–August 2), and Tucson Bird Alliance's Southeast Arizona Birding Festival (August 6–10).

And if sheer volume of hummingbirds is the experience you're after, the migration of the country's sole eastern species, the Ruby-throated Hummingbird, is also spectacular. To catch Ruby-throats on their Gulf Coast–hugging journey south, head to the HummerBird Celebration in Rockport, Texas (September 18–21). While short on variety, "You can see tens of thousands of hummingbirds if you hit it right," Williamson says. *—Douglas Main*

A) ANNA'S HUMMINGBIRD; B) BERYLLINE HUMMINGBIRD; C) COSTA'S HUMMINGBIRD; D) BROAD-BILLED HUMMINGBIRD; E) RUFOUS HUMMINGBIRD; F) BROAD-TAILED HUMMINGBIRD; G) CALLIOPE HUMMINGBIRD; H) BLUE-THROATED MOUNTAIN-GEM.

PHOTOS CLOCKWISE FROM TOP LEFT: TYLER MCCLURE/AUDUBON PHOTOGRAPHY AWARDS; WILDPIX 645/SHUTTERSTOCK; CANDICE LENNEY/AUDUBON PHOTOGRAPHY AWARDS; MICK THOMPSON; RICK & NORA BOWERS/ALAMY; SYLER PERALTA-RAMOS/AUDUBON PHOTOGRAPHY AWARDS; TOM TAYLOR; JACE STENERSEN/AUDUBON PHOTOGRAPHY AWARDS

BEHIND THE SHOT

# On Balance

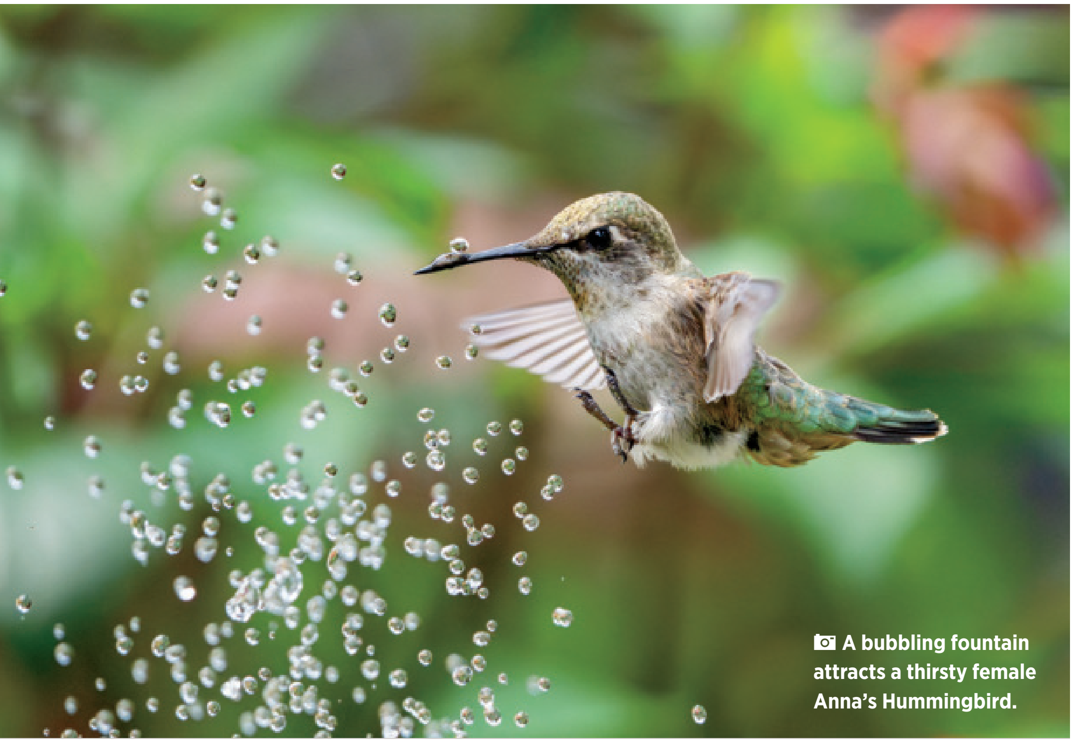
How a photographer turned her yard into a hummingbird portrait studio.

**WINGS ABLUR, ZIPPING FROM** bloom to bloom, hummingbirds rarely seem to rest. Photographer Soo Baus can relate. Between shifts as a trauma ICU nurse, Baus is usually outside, camera in hand, searching Seattle's parks for birds. But when a slow recovery from COVID-19 sapped her energy in the summer of 2023, she decided to focus on birds closer to home. In particular, she turned her attention to her resident frenetic fliers: Anna's Hummingbirds. With a few tweaks to her yard and a lot of patience, Baus captured some of the best photos she's ever taken of the birds—right outside her front door.

First, Baus gathered the elements of a "hummingbird playground," including a bubbling water fountain and lots of nectar-rich flowers, chosen at a local nursery to bloom throughout the season. Then she got creative. Instead of planting directly in the ground, Baus kept the flowers in small pots and balanced them on stools, stumps, and folding tables in her yard, which allowed her to rearrange things to catch the perfect light or change up the background of her photos. "Everything was mobile," she says."I could move things everywhere." She even set the flower pots on lazy Susans, which she could rotate to capture fresh angles.

Baus has a couple of other tricks—like taking down her nectar feeders once she sets up her camera, to encourage hummers to visit the more photogenic flowers—but the real key, she says, is putting in the time. During what she called her "hummingbird summer," Baus spent up to seven hours each day photographing in her yard: from around 6:30 to 11 a.m., then a few more hours in the afternoon if the light was good and she had the energy. And while Baus has upgraded her gear over the years (she currently uses a Sony Alpha 1 camera with a 200–600mm lens; "I'm stopping here—well, maybe not"), she believes photographers at any level can take pleasing hummingbird pictures. Get a feeder or a flower the birds like, she says, and then "go and sit. Once they're comfortable with you, they will come and visit."

One more tip: Make sure to look through all your photos. Yes, all of them. Because hummingbirds move so quickly, Baus shoots up to 30 frames per second. It's often only later that she sees the details—like a perfect sphere of water seemingly suspended on the bird's delicate bill—that make the picture. "There's always surprises." —*Zoe Grueskin*



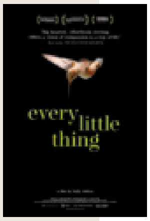
A bubbling fountain attracts a thirsty female Anna's Hummingbird.

PHOTO: SOO BAUS

WATCH

# Hummingbird Hospital

Behold a mighty devotion to some of our smallest birds.



**HUMMINGBIRDS'** lives may be short, only about five years, but they make every second count—perhaps 10 times as much, given their 1,200-beats-per-minute heart rates. For rehabilitator Terry Masear, it's that delicate balance between fragility and vitality that anchors her work, chronicled in the gorgeous and affecting documentary *Every Little Thing*.

Masear tends to all of her Southern Californian patients—from an orphaned Allen's Hummingbird that fell from his nest to a spirited hummer missing feathers after a sugar-water incident—with painstaking, all-consuming care. Following Masear through a spring and summer, the film hums with an anxious question: Which birds will make it back into the wild?

Streaming widely, *Every Little Thing* is about learning to love on the scale of centimeters and to see, as Masear does, the greatest significance in the smallest bodies. It's about waiting patiently as a battered bird musters the confidence to make one more flight. —*Jasper Davidoff*

AT HOME

# Heat-Proof Your Nest Box

Four strategies to protect nestlings from summer's extreme temperatures.

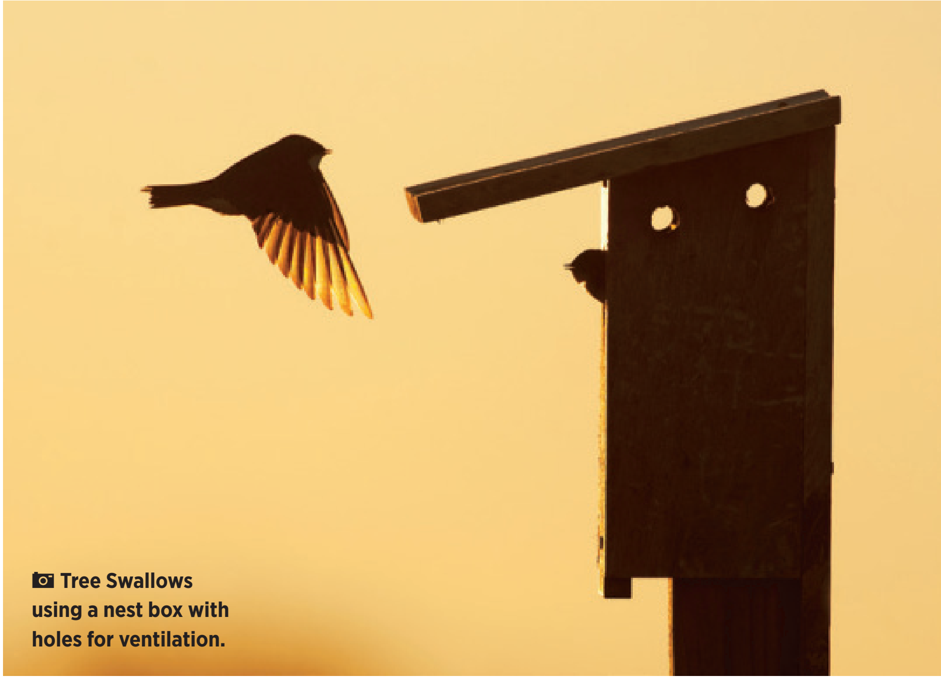
**INSTALLING A NEST BOX** near your home is a wonderful way to support local birds and draw them close. But soaring temperatures can turn a nest box into a miniature oven, posing a deadly risk to chicks. Thankfully, simple interventions can keep these spaces habitable—and help birds survive and thrive in a warming world.

**AVOID DIRECT SUN.** Shaded spots under trees are much cooler than open areas and are suitable nest box sites for birds like wrens and chickadees. The direction the nest box faces also makes a difference: Try to orient the opening toward the north and east, away from afternoon light. If possible, put out more than one nest box. Cavity nesters can't build their own nests, so they have to take what they can get. "Let's give our birds a chance to choose what they like," says Emerson Keith Bowers, an ornithologist at the University of Memphis.

**MIND THE GAP.** For species like swallows and bluebirds, which prefer nest boxes out in the open, build a heat-safe nest box from scratch or modify one you purchase. Holes and slits can help nestlings keep cool: Try leaving a small gap between the box's roof and the top of its walls, or fashioning the entrance as a long and narrow opening, rather than a small round hole. These "slot" nest boxes allow more airflow while minimizing the danger from predators or parasites. Plus, when chicks get large enough, more than one can gather at the entrance for a breather—or for dinner.

**ADD A SHIELD.** The North American Bluebird Society recommends insulating your box by topping it with a slab of Styrofoam or wood. For an easy heat shield, place a sheet of white or reflective material (polystyrene works well) above the roof, using spacers to leave a gap for airflow. You can also use heat shields on the box's sides.

**PAINT IT WHITE.** A coat of white paint reflects sunlight and can lower air temperature inside the box by as much as 8 degrees Fahrenheit, according to Katie Stumpf, a biology professor who studies Eastern Bluebirds at Alma College in Michigan. "That's a big difference," she says. "None of our white nest boxes ever reached the lethal temperature." —*Alice Sun*



Tree Swallows using a nest box with holes for ventilation.

DIY

## This Drip Is a Snap

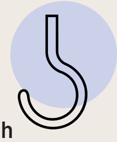
Running water can attract birds and help them beat the heat. You can build an easy dripper with materials you have on hand.

**GATHER SUPPLIES**

Most importantly, you'll need a refillable reservoir. A five-gallon bucket works well, but so do water jugs or plastic bottles salvaged from your recycling. Installing your creation might call for a hook or sturdy cord.

**SET THE RATE**

Using a safety pin or small nail, carefully punch a tiny hole in the bottom of your vessel. To test the flow rate, add some water and time the drips: A droplet every one to three seconds is ideal.



**HANG IT UP**

Balance or hang your contraption over a birdbath or basin on the ground, and let 'er drip! Refill as needed. Clean the basin often: Rinse and scrub with nine parts water to one part vinegar (skip the soap). —*Z.G.*

PHOTO: JOHANN SCHUMACHER/AUDUBON PHOTOGRAPHY AWARDS

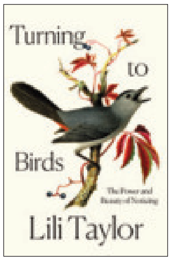
NEW ACT

## Stage to Page

Catching up with actor, birder—and now, author—Lili Taylor.

**EVEN AT AGE 10, LILI TAYLOR** had an eye for birds. She remembers doodling an advertisement for the birdseed sold at her dad's hardware store—it featured a despondent-looking creature she dubbed "hungry bird." But the Emmy-nominated actor didn't start birding in earnest until around 20 years ago. Feeling depleted after more than two decades working on stage and screen, she left New York City for a respite at her house upstate. There, in "solitude and silence," Taylor began to tune in to the avian dramas all around her. As she recounts in her new memoir, *Turning to Birds* (Crown, $30, 208 pages), it was just the "oomph" she needed to return to her own demanding life.

The book, Taylor's first, charts her blossoming as a birder, from a casual, out-the-window observer to a binocular-toting, festival-going enthusiast who puts up feeders wherever she's sent on location. Taylor sees a kinship between birding and acting: Both require core skills of "listening, attention, and investigation." Intriguingly, though, she describes her career mainly as a job like any other (apart from the unusual hours). Sure, she stars in television shows and Broadway plays—but birds, in Taylor's telling, are far more glamorous. The celebrated thespian sounds starstruck when she describes witnessing the immense assembly of Sandhill Cranes on the Platte River or watching Chimney Swifts swirl down to roost at dusk.

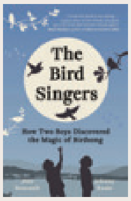


Taylor's wonder has also led her to become an advocate—or as she likes to put it, an "ambassador"—for birds (she has been a National Audubon Society board member since 2016). "I've gotten really clear about what I love," she told *Audubon*, "and I'm getting ideas about what I can do about that." Sometimes she finds opportunities to help birds close to home, such as by filling her garden with native plants. But more and more often, Taylor is looking outward: contributing to community science, collaborating on Audubon's Grammy-winning Birdsong Project and other creative efforts, and doing what she can to spread the word about the threats birds face. Her book is the latest step.

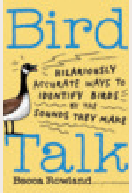
Occasional mention of other movie stars aside, *Turning to Birds* is a profoundly relatable story about falling in love with the avian world. Taylor initially doubts her species identification skills, then builds them up. She finds that birding is often more rewarding alongside friends. Taylor knows that getting into birds—or contemplating what we can do to protect them—can be overwhelming, so her book is approachable by design. "Keeping it simple and keeping it personal," is how she describes her intent. "Here's what I've been trying to do, and here's where you can start." —*Z.G.*

## Hot Off the Press

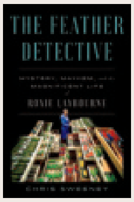
New books that make any summer day feel like vacation.



**It could be the start of a fantasy novel: In rural France, two boys discover an almost eerie talent for mimicking birdsong. But competitive bird callers Jean Boucault and Johnny Rasse's dual memoir, *The Bird Singers* (Greystone Books, $28, 240 pages), is all true, and arguably more alluring.**


Bird
Hilariously accurate ways to identify birds by the sounds they make
Talk
Becca Rowland

**Squeaky whiteboard? American Kestrel. Ripping your pants? The hiss of a Turkey Vulture. Charming drawings and humorous yet genuinely helpful comparisons make Becca Rowland's *Bird Talk* (Storey, $16.99, 256 pages) a playful introduction to identifying birds by ear.**



**True crime meets birding in this biography of Roxie Laybourne, the world's first forensic ornithologist. Often ID'ing birds from mere feather fragments, Laybourne helped solve murders, bust poachers, and inform conservation—and her work on avian-airplane collisions made the skies safer for everyone. Chris Sweeney's *The Feather Detective* (Simon & Schuster, $30, 320 pages) is a captivating tribute to Laybourne's remarkable life.**

PHOTO: MIKE FERNANDEZ/AUDUBON

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Where birds inspire art, awe, and action

## WOODPECKER TRINITY / TRINIDAD DE CARPINTEROS BY ROBERTO BENAVIDEZ

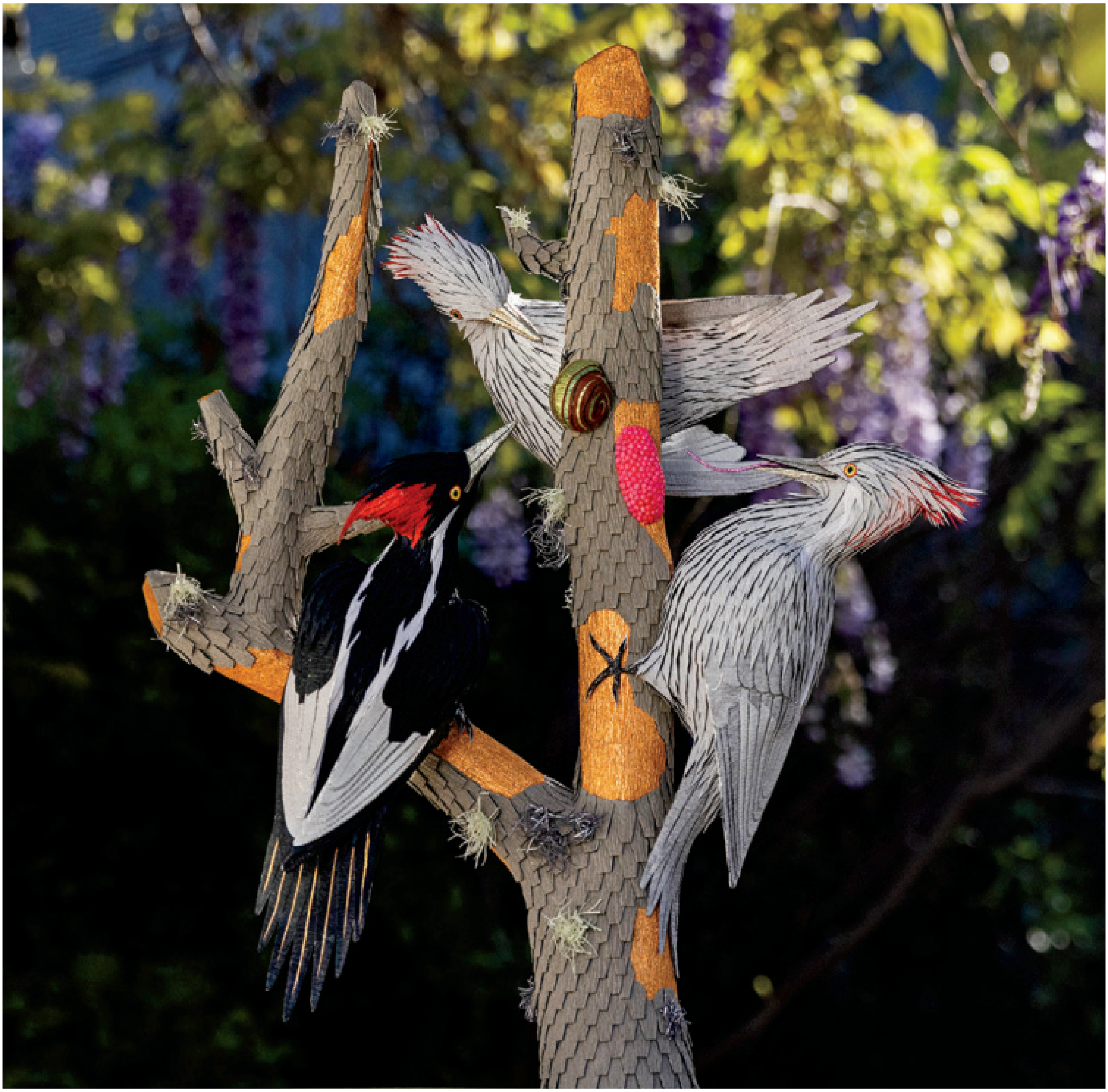

PHOTO: ALISHA JUCEVIC

See other artwork from The Aviary series at **audubon.org/the-aviary**.

ROBERTO BENAVIDEZ HAS LONG BEEN FASCINATED BY SCULPTURAL ART, BUT IT TOOK HIM YEARS to hit upon the perfect medium: the piñata. After first crafting fantastical animals, Benavidez, a Los Angeles–based artist of Mexican and European descent, turned to replicating real avian life, encoding messages through subtle twists. “The more I learned about birds, the more I could see that I could say things with them,” he says. For this piñata, he reimagined John James Audubon’s watercolor of three Ivory-billed Woodpeckers, a species that is either one of the world’s rarest, or extinct, largely due to the destruction of its bottomland forest habitat. Benavidez began by layering papier-mâché over balloons to shape the birds’ bodies. He used paperboard to craft the wings and beaks, and wire for the legs and feet—adding color and texture with crepe paper cut into a feathery fringe. In a departure from the original painting, Benavidez, whose work often hints at queer sexuality, depicted all the woodpeckers as males, identifiable by their red crests. He covered two birds’ plumage in white paper, creating a ghostly effect that references the species’ uncertain status. The third bird pops in full color, a hopeful beacon of the possibility of life. —*Jessica McKenzie*

> A ghostly effect references the species’ uncertain status.

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GREAT EGRETS. PHOTO: LANCE LEONHARDT/AUDUBON PHOTOGRAPHY AWARDS

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